GAS JOURNAL

LIGHT ⁂ HEAT ⁂ POWER ⁂ BYE-PRODUCTS

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EDITORIAL NOTES.

An Attractive Programme for Southampton.

HEARTY congratulations to the Executive of the British Commercial Gas Association on the attractive programme for the annual meeting of the members at Southampton from Monday, Oct. 3, to Wednesday, Oct. 5. The President of the Association this year is Sir Russell Bencraft, M.R.C.S.E., J.P., Deputy-Chairman of the Southampton Gas Light and Coke Company, the Chairman and Directors of which have, with great enthusiasm, entered into the arrangements for the meeting in the endeavour to make it a memorable and valuable one. A great novelty for many of the members will be the dinner on board R.M.S. *Majestic* on Monday evening, through the courtesy of the Directors and Managers of the White Star Line. The dinner is at the generous invitation of the Chairman and Directors of the Gas Company. His Worship the Mayor (Alderman P. V. Bowyer) will welcome the members at their business conference; and there will also be a reception by him and the Mayoress in the Royal Pier Pavilion on Tuesday evening.

The full programme is reproduced elsewhere in this issue. It will be seen from it that the special items which will be under consideration are comparatively few, but there is the promise that their quality will be of exceptional order. At the reception there is to be a lecture by Sir Bruce Bruce-Porter, K.B.E., C.M.G., M.D. His topic will be "New Health: The Importance of Health in Industry." At the conference itself, the Executive Chairman, Mr. F. W. Goodenough, C.B.E., will make his report; and this will be followed by the Presidential Address of Sir Russell Bencraft. There will also be an address by Miss Gladys Burlton, B.A. (Lond.), on the important subject of "Salesmanship in the Showrooms." This will be open to discussion, and in view of the large amount of modernization which has been going on in gas showroom practices and methods, with the higher training of the men and women engaged in them, we predict an excellent discussion. Another outstanding feature will be the paper by Mr. Ralph Halkett, General Manager and Secretary of the Sheffield Gas Company, on "The Commercial Prospects, and Future Co-operation of the Gas Industry." We know of no better means for stimulating present action than giving deliberate consideration to the prospects of the future, and to what, in view of them, is necessary for the development of the industry. There will be an interesting memorandum from the Executive Committee regarding the position of the question of the inclusion of flueless rooms in modern homes; and united with this will be a report on special research into the matter which has been carried out, at the request of the Executive of the Association, by Mr. Arthur H. Barker, B.Sc., B.A., Lecturer in Heating and Ventilating Engineering at University College, London. Other items will be found in the programme.

The arrangements for the meeting foreshadow a large success; and we are confident the "bookings" for attendance will be heavy.

Electrolytic Corrosion of Mains.

TWENTY-FIVE years ago, at a meeting of the old Gas Institute in Southampton, Mr. James Swinburne, the then President of the Institution of Electrical Engineers, delivered a lecture on the "Electrolysis of Gas-Mains." Prior to that, for years there had been friction between the (at that time existing) National Telephone Company and the electric traction industry, owing to the disturbance of the telephone systems. The Telephone Company could not get legal redress, because the traction industry was performing its functions under statutory powers, and was doing so by the then best-known means. Subsequently, a Joint Committee of both Houses of Parliament was appointed—this was the oft-quoted Lord Cross's Committee—to go into the whole question. Again the Telephone Company did not get the protection they desired, owing to the fact that telephone circuits could be easily protected by doubling, instead of using earth returns. At that inquiry gas and water companies appeared; and that was practically the opening-up of the question of the electrolysis of mains, which had then awaited satisfactory settlement for at least a decade. However, all that was gained was that the Committee decided that the tramway people should take all reasonable precautions in building and working their undertakings, so as not injuriously to affect by fusion or electrolytic action any gas or water pipes. That was not a success over which there could be any great elation. But since the recommendation was made, and since Mr. Swinburne's lecture, nothing much has been done in regard to this matter by gas and water undertakings, though from time to time we have had introduced to notice what Mr. Swinburne a quarter of a century ago described as "ghastly specimens" of pipes disabled by electrolytic attacks. In the opening years of this century, fears were great respecting the injury and depreciation of underground mains by electrolysis; but there was little real information available as to the true effects of nomadic currents from the tramway systems. The tramway engineers at that time were using opportunities for applying to their work such precautions as were known for preventing stray currents; and Mr. Swinburne made certain suggestions which, in his opinion, gas and water undertakings could adopt to protect their pipes. But the precautions of the tramway engineers of those days have not been positively efficacious; and the protective proposals of our electrical mentor for gas and water mains have not proved entirely practicable, to say nothing of the expense of application. In the concluding part of his lecture twenty-five years ago, Mr. Swinburne said: "It behoves gas and water companies to watch "carefully. The question of electrolysis is not really "settled. In the course of years, we may have more in-"formation; and we may then find either that the stray "currents are practically harmless, or new laws have to "be made." The position then is much the position still. True, knowledge has advanced. But it is equally true that the source of stray currents is the place at which the most effective work can be done to obviate electrolytic action, and that there is comparatively little of a practicable nature that gas undertakings can do to ward-off the attacks of wayward currents. As a quarter of a century

ago, so now—the best work that can be done is to "watch carefully," but watching carefully involves systematic testing.

A valuable study of the phenomena of the electrolytic corrosion of mains has been made by M. A. Bolzinger, of the Nantes Works of the European Gas Company; and the results have been embodied in a report to the Board, to whom, as well as to M. Bolzinger, our thanks are due for their permission to give to the British gas industry through the columns of the "JOURNAL" a translation of the document. It is in four parts; the first two were published last week; the third is given in this issue; and the fourth will appear next week. We compliment M. Bolzinger on the fine thoroughness with which he has carried out his investigation, and presented the results. The thesis is valuable not only for its suggestiveness, but for the concentrated form in which it deals with a polyphased and complex subject, which has very real importance for every engineer responsible for the property of gas and water undertakings in the subsoil of our streets, in which property an enormous amount of capital has been invested.

The first part of the study constitutes an excellent review of the phenomenon of electrolysis, and the effects of electrolytic corrosion and chemical action upon main pipes and services. As the author incidentally points out, the results of electrolytic and chemical corrosion are often similar. It would therefore certainly be advantageous to be able to read, from the external evidence of attack, the origin of the damage; but the residues of corrosion, whether electrolytic or chemical, vary according to the nature of the materials with which the pipes are in contact. In a letter which conveyed M. Bolzinger's permission to publish the report, he stresses this point in these sentences: "You may care to draw the attention of your "readers to the interest which attaches to their being "able to show by chemical analysis that a case of cor- "rosion is indeed due to electricity. In the majority of "provincial towns, the only source of stray currents is "normally the tramway system; and so the only under- "taking that can be responsible is that which controls "the trams. If, therefore, one can prove that corrosion "is indeed due to electricity, the question of responsi- "bility is solved. I have indicated in my report how one "can prove that the corrosion is due to electrolysis in the "case of lead; and it would be of interest to discover "something analogous for wrought and cast iron. In "France we are making a serious study of this question."

In the second part of the report, the question of the formation and causation of stray currents receives consideration; and we are then taken on to practical matters affecting the protection of main systems against the corrosive action of stray currents. In this connection, there will be general agreement with the author that the proper method for the protection of underground pipes from electrolytic corrosion is by the suppression of escaping currents by exacting some measure of observance of the desired conditions by electricity using or supplying undertakings. This is the most effective means and the most logical, because it is obviously better to eliminate the evil at its source, than for external property to have to provide defence against its offensive acts. A number of protective methods for mains have been advocated; but as is shown by our Nantes friend, they are not very effective, or are very costly, or simply promote the migration of trouble from one point to another. Take, for example, paints and dressings. The investigation indicates positively that these may become more of a danger than a protection; and the same may be said of insulating wrapping, for reasons which will be found in the report. Then in regard to insulating joints, their use may simply shift known points of corrosion to unknown points, where much greater damage may be wrought. Baffle-plates interposed between the main and the rail act as a return—the current, instead of leaving the main, departing by way of the baffle-plate, which gets corroded instead of the pipe itself, and so does not matter. Unfortunately such protection can only be local, and by no means solves the problem, although it may with great advantage be employed in the case of local attack. Lowering the potential of the mains is practically ruled-out by M. Bolzinger. Again, there is little use in undertaking the electrical "drainage" of pipes, unless it is done thoroughly, inasmuch as if it is only partially carried out, there will result differences in potential between the drained pipes and the others; and thus the latter may find themselves in a far worse situation from the point of view of electrolysis. If this system is applied, it is obvious that one must aim at the coupling-up and draining of all underground pipes and cables; but, owing to the increase in the intensity of the current, such drainage would constitute a real danger for pipe-joints offering high resistance, which happens to be the case with gas and water pipes. The author, therefore, strongly discourages the use of this method, unless it is a case of the choice of evils. Summed-up, it is clear that the methods of direct protection of mains may prove extremely costly, and their efficacy by no means sure.

Thus we are left to look in the most rational direction for relief from damage from this trouble—by the suppression of stray currents at their source; and this can only be realized by the betterment of the conditions under which electrical systems function. It is manifestly not right that the defection of electrical energy from the path of virtue should involve other occupants of roads in expense for protecting themselves against injury. We have, however, to face the fact that, though official regulations may be made to mitigate the trouble of wandering currents, so long as damage is caused there exists the proof that the regulations are not absolute in providing security. In fact, it is well known that no electrical distribution system is perfect, and that loss of current is continually going on, and the current so escaping strays somewhere. It is quite true, as already indicated, that more trouble is caused by the currents escaping from tramway systems than from those of town supply undertakings; but it is the duty of the owners of such undertakings to make their systems as innocuous as possible to their neighbours. Although this is to their own economic advantage (which, of course, is a great incentive), the fact remains that they are far short of being completely successful. One way of ensuring that all that is possible is done by tramway and electricity supply concerns is by careful supervision of gas-distributing systems by the responsible engineers. How such supervision may be carried out is largely the subject of the fourth part of M. Bolzinger's report; and there our technical readers will find much interest and instructive suggestion as to methods, the application of which will comply with the rational and excellent rule that the best course to take is to forestall unpleasant events, instead of leaving them to surprise and probably overwhelm one.

To Develop Gas Consumption at Bradford.

THE Bradford Corporation Gas Department has been operating under legislation and practices which the past two or three years have shown required modernization in order to promote the services and business of the undertaking, and to bring it into the front rank of gas concerns in the United Kingdom. If the Corporation next week adopt (as we think they are bound to do in the interests of a great community) a report, prepared by the Gas Engineer and Manager (Mr. Ernest J. Sutcliffe), and unanimously endorsed by the Gas Committee, the first step will be taken in removing from the undertaking the shackles which have to a very considerable extent impeded its progress, as judged, for example, by the average consumption of gas per consumer. We have reproduced the report in later columns, and the details of the proposals, and the arguments advanced in favour of them, will, we feel sure, be read with much interest. In brief, Mr. Sutcliffe proposes the removal of restrictions regarding ordinary meters and their hiring-out in the manner now customary. He also suggests the general adoption of prepayment meters; also, that charges for gas services should be abrogated, and that services up to (say) 25 yards should be laid free. We need not dwell upon the effects of the old policy. They stand out clearly from the report. If endorsed by the Council, the proposals will not only, in the matters treated upon, co-ordinate practices in the various districts of the gas-supply area, but they will bring the methods of procedure for the development of the

undertaking, and the protection of its business, into harmony with the conditions which are approved almost generally throughout the gas industry, and which are positively necessary in the interests of a gas undertaking in current circumstances. As Mr. Sutcliffe says: "If "the suggestions are adopted, then many old consumers "may be retained. Those lost temporarily may be re-"covered; and business generally may be stimulated and "revived in such a way as would be impossible if present "conditions and customs are maintained." Of course, the recommendations now made can only represent the first stage in the work of modernizing business methods and the relations of consumers to the undertaking. There are other matters which, we have no doubt, the Gas Committee will take into consideration as soon as the work necessitated by the present plans becomes well-established. In their gas undertaking, the Corporation have a very valuable property; and to uphold and enhance that value, it is necessary to maintain and increase the business. A large additional consumption per consumer can be met without a corresponding increase in the plant. That is an important consideration.

Coke-Oven Managers on Tour—German Gas Scheme.

BRITISH coke-oven managers are at present on tour in Germany and Belgium, investigating the progress in practices and results of their Continental colleagues, who of late have had a rosier time than that of the visitors. In their journeyings from plant to plant, they may pick-up a little information concerning the further development which the German colliery and coke-oven magnates are hoping to bring to maturity. That is the supply of coke-oven gas in bulk to gas suppliers almost throughout Germany—with great discretion taking the fat and leaving the lean areas—gradually shutting-down all the gas-works within reach of the high-pressure transmission system as at present mapped out, and, as a concomitant, monopolizing the supply of all the domestic and industrial coke and other bye-products of carbonization. No doubt our readers in the coke-oven industry have been taking a deep interest in the information we have been publishing from time to time regarding this ambitious project, and the attitude of the German gas industry towards it.

The latest critical survey of the scheme as published in the "JOURNAL" was the paper which Herr Müller, of Hamburg, read at the last meeting of the German Gas and Water Association; and we think that those members of the British coke-oven industry who have read our translation of that communication will agree with us that there is more at the back of the scheme than at first meets the eye, and that what is in the rear will be to the pecuniary advantage of the coke-oven interests to a greater extent than for the German gas industry. Beyond the far-reaching effects to which we have called attention, it is obvious that it would remove the competition not only between the differently owned coalfields of Germany for the supply of coal for domestic and industrial purposes, but of British coal, the demand for which from Germany would at once cease. This is spoken of as an economic advantage for that country. British coalowners will probably note this exemplification of the love of the Ruhr coalowners for their country, and incidentally for themselves. It is obvious that, if this scheme went through, there is in it the means of conferring upon the Ruhr colliery and coke-oven interests an almost exclusive dominion over the fuel and bye-product business in Germany, which would not be to the internal advantage of that country. On the other hand, of course no one can blame the Ruhr coalowners for manœuvring with a view to gaining, if at all possible, something to their own economic advantage. For example, the gas-supply scheme would without doubt afford a solution in large measure of the small-coal problem; but the supply of coke-oven gas to such gas undertakings as are willing purchasers up to an individual given quantity would be effective also in that respect. It can further be admitted that, where gas-works are operating uneconomically, there is waste of coal (which, by the way, Herr Müller estimates at 700,000 tons); and naturally the elimination of this waste is of national importance. But the high-pressure supply of coke-oven gas from the Ruhr is not the only means of elimination. It could just as easily be effected by the extension of the producing plant of, and distributing mains from, the larger and more economically operated gas-works of the country, which are producing gas at prices as low as, and in some cases lower than, gas is being offered at by the coke-oven owners.

However, our British coke-oven friends will have noticed, from the articles and comments in the "JOURNAL," that the attitude of the German gas industry towards the Ruhr coke-oven scheme is not one of enthusiastic acceptance. And a study of the financial computations in Herr Müller's paper, and the supply conditions formulated by the coke-oven owners, will show that the financial aspects are not strikingly inviting, and that the proposed terms of supply and the attached restrictions savour somewhat of a dictatorial origin, and are not exactly what one would expect from a body of industrialists desirous of bringing to a finished state a gigantic scheme of this nature. There is little in Herr Müller's paper which suggests that the Ruhr colliery and coke-oven magnates recognize that in this matter there are interests besides their own which require to be protected. We hope the British coke-oven managers now on tour in Germany will not return with any idea that a like scheme could be recommended in this country. We do not think they would entertain anything so foolish. The gas industry of this country is willing to be friends and collaborators with the coke-oven industry; also customers on mutually fair terms. But it would not be disposed to confide all its obligations regarding the provision of gas to the hands of the coke-oven interests.

A Change of Route.

THE Prime Minister, in a speech last Saturday week at Douglas Castle, had much to say regarding his recent Canadian experiences. In the course of his travels, he corrected the impression that Great Britain is decadent or in despairing mood. But of more immediate concern to us—as an industry sharing in the responsibilities of this country, and in its prosperity and adversities—is the appeal which the Premier made for greater co-operation between employers and employed. In the gas industry, we have long since learned the value of this; and there can only be the more regret from among us that in other industries more has not been done to inculcate the idea of mutal interest, and to promote the spirit of co-operation. There is ground for concern, owing to the interrelation of industrial interests, and the considerable reaction of the conditions of other industries on our own.

Last year we passed through one of the most gruesome industrial experiences in our history; and we know full well that, from beginning to end, it was the work of those who seek political ends through the wrecking of national prosperity, in the maintenance of which our workers are so deeply involved. Mr. Baldwin is optimistic, and we hope not unduly so. A new era appears to be dawning as a result of the turmoil from which we suffered last year. A majority of the labour leaders are adopting a more rational attitude, and are setting their faces sternly against the men who are out to create discontent by slaughtering employment, in order to produce the revolution which they consider necessary to the attainment of their objectives. The real trade union leaders see the foolishness and danger of such tactics. The object-lessons of last year have opened their eyes and expanded their understanding, although not yet sufficiently to see that the new legislation defining legitimate trade union action is capable of being an excellent help to them in their struggle with subversive forces. They still speak as though the Trade Disputes Act was a malevolent production; they have swallowed the fact that their strongest appeal and wildest vituperation against the measure left the country unmoved and unresponsive, which was the most eloquent verdict in its favour, and against those who brought upon the country the industrial disaster of 1926. The events of that time have brought down from its pedestal the strike as an effective method in furthering the objects of the ultraists in the labour world.

This year has seen less disturbance of work through

strikes than there has been for some years past; and the ambition of certain labour leaders to promote one large and absolute trade union for all industries has fallen to pieces. The major number of the leaders see that, even if it could be accomplished, it would be unwieldy and immobile. There were indications of that during the general strike last year. The conditions are too complex for the success of such a scheme. There cannot even be amalgamation of interests in individual industries that require a diversity of workers; and much less can there be an amalgamation of the workers in different industries, owing to the antagonism of interests in regard to employment. We have observed lately how the interests of the railway men in securing as much traffic as possible for the railways, and so providing employment for their own ranks, clash with the interests of the transport workers in getting as much traffic as possible on the roads. The railway men and transport workers saw last year, during the rich lessons provided by the coal stoppage, how employment for them can be spoiled when the miners are kept from work for months through the leadership of Communistic fanatics. We believe the railway men are now going the right way to work. Admittedly, they are to-day among the best paid workers in the country; and it is to their interest to do all possible to protect the conditions which will support their rates of pay, as well as the maximum volume of employment. The Premier in his speech referred to the lead of the railway companies in enlisting the co-operation of the railway men in furthering proposals which are intended to bring about an improvement in railway services to the benefit of the railways. He regards this as a practical example of the utility of co-operation of management and labour; and he looks forward to a spread of such ideas. He also pointed to another condition respecting which there is much misunderstanding. Some people believe and talk as though in our factories and workshops constant friction prevails. Those who know the real conditions are aware that this is not the case. Of course, there are always those who make it their business to stir-up trouble; but they are not typical. And the Prime Minister does not believe that the efforts of those who realize what peace means for industry and for employment will be frustrated by the few who clamour noisily for hostility and disruption.

Ever since the war there has been a deviation of the policy of the trade unions from its main road. We hope the proper reading of present conditions is that a return is being made, even though incidents at the Trade Union Congress in Edinburgh this week may engender some doubts. It is sometimes necessary to read between the lines of what is reported in order to realize the truth, and to discriminate between the words from the platform and the acts in the Council chamber.

New Gas Legislation.

The National Fuel and Power Committee have entered actively upon the consideration of the reference to them by the Board of Trade of the memorandum prepared by the National Gas Council regarding the proposed new legislation for the gas industry. The nature of this is well known. Evidence has already been laid before the Committee; and a further sitting, it is understood, will take place this month. The report of the Committee, we presume, will guide the Board of Trade in the action they will pursue.

Manchester Gas Explosion.

The latest information to hand concerning the explosion at the Bradford Road (Manchester) Gas-Works, which wrecked one gasholder and seriously damaged another, is that given at a special meeting of the Gas Committee on Aug. 26. It was reported that the cause of the explosion had not then been ascertained, and that the expert investigation was still proceeding. The Chairman (Alderman T. Cook) made the remark that it was not yet known what revelations might be made. Meanwhile, the Committee have decided to repair one of the holders, which will take about six weeks to accomplish, and will cost approximately £5000. The question of what shall be done with the more severely damaged one, which was reduced to a mass of crumpled plates, has been deferred for future consideration. This, however, will not in any way interfere with the provision of an adequate supply of gas. Photographs of the damage were published in last week's issue of the "JOURNAL."

Stamp and Other Duties.

It is satisfactory to learn that the National Gas Council have been successful in obtaining for statutory companies a remission of stamp duties. When the Finance Bill was originally introduced, it proposed, in the case of amalgamations between limited liability companies, to remit certain stamp duties—viz., capital duty and transfer duty. The Conjoint Conference of Public Utility Associations made representations to the Treasury that these concessions should be extended to statutory companies. The result was that the original clause was withdrawn, and a new one covering both limited liability and statutory companies was inserted in the Bill and approved by Parliament. Thus an old grievance has been removed, and what was considered to be an injustice has been rectified. This is a good thing in view of the extended adoption of the policy of amalgamation in the gas industry.

Gas-Works Effluents.

In a recent paper by Mr. D. W. Parkes, B.A., B.Sc. (see "JOURNAL" for April 6), reference was made to a continuous apparatus for the removal and recovery of tar acids from ammonia stills. In a short article (accompanied by tabulated results) which has been forwarded for publication by Messrs. Robinson Bros., Ltd., of West Bromwich, information concerning further work with the process is made available to our readers. As will be seen from the article in later columns, a new carbon manufactured by a British firm has been used in this work. This carbon is found to be much more active with regard to phenols than any other which has been examined by Messrs. Robinson, added to which virtue is the fact that it is less costly. The process as developed is briefly explained, and summarized results are given of six continuous runs carried out on liquor from different types of carbonization plant. In every case, the phenols were removed to the extent of 99 p.ct. —in fact, in some cases the removal was effected to only 0·1 p.ct. short of 100 p.ct. The reduction of the oxygen figure depends largely on the original thiocyanate content of the liquor. The degree of absorption of oxygen is shown in the six cases. It is also mentioned that the process could be modified to give practically 100 p.ct. reduction of the thiocyanic acid. Accompanying the removal results are given the costs of treatment at per gallon, together with the value of the tar acids recovered. It is remarked that cost varies with the type of the liquor, and not with the phenol content. The process is, in fact, favoured by liquor of high phenol content.

Rebates on British Steel.

There are twenty-eight makers of steel parts in this country who have resolved to meet foreign competition in the most practical way available; and we hope consumers of steel in Great Britain and Ireland will give the firms in question strong support. They have offered to all users of steel who are prepared to confine their purchases of the defined materials to the signatories of the scheme—which means the renouncement of similar exotic materials—a rebate at the rate of 7s. 6d. per ton on joists, and 5s. per ton on a large number of ordinary quality steel plates, sections, and flats. Provision is made in certain circumstances for an additional rebate on joists up to 5s. per ton. The arrangement does not apply to material sold for export.

Cooked Statistics.

The country has learned that, when Mr. A. J. Cook, the Secretary of the Miners' Federation, makes statements regarding the coal industry, he does so with an object in view, and that there is always room for heavily discounting what he says. He has again been holding-up a bogey before the public, and threatening further trouble if unemployment in the industry continues at the present level, or, rather, the higher level at which his imagination, and not fact, allows him to place it. He states that on July 25 there were registered

throughout the country 258,203 unemployed miners; and that it is computed that between 50,000 and 100,000 more have been struck off the register because they have been unemployed so long. Let us suppose Mr. Cook's figures total to 333,000. According to the Board of Trade returns, on the date mentioned the employed in the coal industry numbered 1,011,900. This, with Mr. Cook's figures, would make a total of 1,344,900 mine workers employed and unemployed. In 1913—the year of record output (287 million tons)—the number of persons employed was 1,105,000! Mr. Cook's statistical work always requires careful examination. It was recognized by the Coal Commission that one of the economic troubles of the coal industry was that it was overmanned for the amount of work to be done. Now fewer men are being employed, and are working with increased efficiency. The strike of last year gave the opportunity for the industry to make a fresh start in bringing the number of men employed into better relation with the work necessitated by demand. That is a point over which Mr. Cook should cogitate. It would provide better (and more profitable) mental exercise than the making of inflated calculations.

PERSONAL.

Sir EDWARD BROTHERTON, of Roundhay Hall, Leeds, has given £100,000 to defray the cost of the library building in connection with Leeds University.

Sir VINCENT CAILLARD, who for 27 years has been a Director of Vickers Limited, and who was mainly instrumental in arranging for the recent reconstruction of the Company (which is now practically completed), has tendered his resignation as from Sept. 1. His colleagues have accepted the resignation with great regret.

The staff and workmen of the Stafford Corporation Gas Department have presented a canteen of stainless cutlery to Mr. CHARLES POULSON, Assistant Engineer at the Gas-Works, on the occasion of his marriage. Mr. Eley alluded to the pleasant relations which existed between Mr. Poulson and the employees of the Department, and wished him every happiness in his married life. Mr. S. Caulfield (Chief Clerk) added his best wishes, as also did Councillor T. H. Tunnicliffe, J.P. (who is a member of the Gas Committee).

Writing from Portobello, Mr. R. T. SIMPSON sends us a copy of a booklet entitled "Collection of 'Wroth Silver,'" which is published by Messrs. George Over, Ltd., of Rugby. Profusely illustrated, the book describes and traces the history of this curious Warwickshire custom, which has survived the centuries at Knightlow Hill; and Mr. Simpson is to be congratulated on this further evidence of his vast store of antiquarian and historical learning. We say "further" evidence, for his many friends, especially in the North, recall, with pleasure, trips which have been rendered the more interesting and instructive by his readiness to share his knowledge.

OBITUARY.

Friends will learn with regret, which we share, of the death on the 2nd inst. of the only son (Seymour John Ernest) of Mr. ERNEST WEST, of Chipscroft, Hale, Cheshire. He was in his ninth year; and died after a short illness.

We are sorry to learn of the death of Mr. CHARLES E. DOVEY, J.P., F.C.A., which occurred at his residence in Cathedral Road, Cardiff, on Friday morning last. Mr. Dovey was born in Pontypool in 1853; and before his retirement in 1919 he was principal of the firm of Messrs. Clarke, Dovey, & Co., Accountants and Auctioneers, Cardiff. Among the many important positions he held was that of Chairman of the Cardiff Gas Light and Coke Company, since the death of the late Col. Fisher. He was an ardent Freemason and a Past-Master of several lodges.

Iron and Steel Institute.—In accordance with previous announcements, the autumn meeting of the Institute will be held, by invitation of the President (Mr. John Craig, C.B.E.) and Council of the West of Scotland Iron and Steel Institute, at Glasgow. The sessions will take place at the Royal Technical College, Glasgow, on Tuesday, Wednesday, and Thursday, Sept. 20, 21, and 22, commencing at 10 a.m. each day.

Gas Meter Pipe to Prevent Fraud.—Mr. Henry Klippel, Gas Appliance Expert to the Brooklyn Borough Gas Company, Coney Island, N.Y., has patented a guard to prevent unlawful interference with the gas meter's proper registration. It is attached to the discharge opening of the meter, and used in place of the ordinary discharge pipe. The following description of the invention is quoted from the patent specification by the "American Gas Association Monthly:" A pipe open on one side, and embodying a reduced upper portion and an enlarged lower portion; there being a screw-threaded neck at the upper open end, appropriate attaching means, and an internal guard and baffle plate mounted therein in the enlarged portion, for co-operation with the open side, and with the discharge passage of the gas meter. The said plate comprises a downwardly and inwardly inclined upper portion and a vertically disposed lower portion terminating in spaced relation from the bottom of the said pipe. It is claimed that the addition of the apliance will not interfere with the proper flow of gas.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organisations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Sept. 12-15.—INSTITUTION OF PUBLIC LIGHTING ENGINEERS.—Conference at Brighton.

Sept. 13.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board.

Sept. 13.—FEDERATION OF GAS EMPLOYERS.—Meeting.

Sept. 16.—GAS SALESMEN'S CIRCLES.—Annual meeting in London.

Sept. 22.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION.—Meeting at Porthcawl.

Sept. 23.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Visit to Hollacombe Works of the Torquay and Paignton Gas Company.

Sept. 30.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Annual meeting at Cambridge.

Oct. 3-5.—BRITISH COMMERCIAL GAS ASSOCIATION.—Sixteenth annual general meeting and conference at Southampton.

Oct. 27.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Autumn general meeting, Grand Hotel, Birmingham, at 2.30.

Nov. 17.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn General Meeting at the Hotel Cecil.

INSTITUTION OF GAS ENGINEERS.

Sept. 12.—Emergency Committee.

Sept. 12.—Finance Committee.

Sept. 12.—Council meeting.

Sept. 12.—Visit to the Shipping Engineering and Machinery Exhibition at Olympia.

Sept. 13.—Education Committee.

Carbonization of Powdered Coal.

Mr. D. J. Demorest points out in a paper presented to the American Chemical Society (Division of Gas and Fuel Chemistry) that Prof. Alfred H. White, of the University of Michigan, has proposed to carbonize coal partially by dropping a steady stream of approximately 10-mesh sized coal through a vertical retort, and removing the products as fast as formed, thus making the operation continuous. At his request, the possibilities of the process have been investigated in the Engineering Experiment Department of the Ohio State University. Coals varying in nature from low volatile to high volatile have been tested. It has been found that about 5000 c.ft. of 700 B.Th.U. gas, 150 lbs. of tar, 2 lbs. of ammonia, and a corresponding weight of a powdered coke are produced. The coke is very easily ignited, and will make an excellent fuel to burn in powdered coal-using power plants, &c. The difficulties encountered and means for overcoming them are discussed.

Large Bye-Product Producer Plant.—An illustrated account appeared in the "Engineer" for Aug. 26 of an extensive bye-product producer gas plant, supplied by the Power Gas Corporation, Ltd., of Stockton-on-Tees, which has recently been put into operation at the works of the Bwana M'Kubwa Copper Mining Company, Ltd., in Northern Rhodesia. It is claimed that, not only does the gas plant itself constitute a considerable advance on all other bye-product producer gas plants hitherto built, but its particular combination with the mining and metallurgical equipment of the users is entirely novel and different from the usual copper mining practice. The gas is employed for power and heating purposes, while the bye-products are used for obtaining the metal from the ore. The process adopted by the Company for leaching the copper out of the ore requires ammonia; and the heavy cost of transport led the Board to the decision that an ammonia recovery gas producer plant, capable of extracting the ammonia from the coal, would make a valuable combination. The tar also has its uses in connection with the process carried on.

ELECTRICITY SUPPLY MEMORANDA.

The Great Delusion.

THE electrical papers are getting genuinely alarmed over the nonsense that has been, and is still being, circulated in the Press regarding the cheapening of electricity through the Government scheme. The "Daily Express," for instance, on Aug. 20 made the foolish statement that "cooking, heating, washing, drying, cleaning—all these services will be electrical when the day of the ½d. electrical unit is reached. The work of the housewife will be reduced by more than 50 p.ct." Occasionally, we have to criticize "Meteor" of the "Electrical Times;" but it would be a mistake to suppose that this means our journalistic friend never says anything with which we agree. On the contrary, there are sometimes in his notes views which could be adopted as expressing our own. In the "Memoranda" attention has often been called to the fact that the lowering of the cost of generation in the super-stations which are to be built under the Government scheme does not imply that the cost of the energy delivered to the consumer will be reduced. "Meteor" puts the matter concisely when he writes:

> It is important to teach the lay Press, the public, and the Government that cheap generation in big capital stations cannot go far towards providing a cheap rural supply of electricity. It was very largely with that object in view that the latest Governmental machinery was set up. Unless the Commissioners and the Central Board can cheapen *distribution*, their efforts to improve the thermal efficiency of generation are rather beside the point. As several critics remarked at the last "I.M.E.A." meeting at Buxton, the Commissioners are doing harm to the good cause by putting high thermal efficiency in their front shop window as the one great desideratum that comes before all others.

And so say all of those who know what they are talking about. But the trouble of the electricity industry is that uninitiated politicians—even Cabinet Ministers and *ex*-Cabinet Ministers—talk as though the one thing needful is to save a little fuel, and so gain in thermal efficiency, overlooking the fact that a still more important matter is to diminish the cost of getting the energy from the power station to the consumer. Yet generation is being concentrated at large stations, and the energy is to be transmitted greater distances from the source of production. What Cabinet Ministers and *ex*-Cabinet Ministers say on this subject is accepted as gospel by the public Press; what experts say is taken with a grain of salt. That is the dilemma facing the electricity industry. They do not know how to get the truth home among the public; and there is fear as to the consequences when the deluded in the time ahead rebel against the prices that will perforce have to be charged for current under the Government scheme.

Overhead Transmission Necessary.

In a memorandum on electrical development in rural areas, the Electricity Commissioners recognize the difficulties which are encountered in the efforts to establish or extend the supply of electricity in rural areas. They acknowledge that the costs of transmission and local distribution represent a substantial addition to the electricity production outlay even in urban centres where the number of consumers obtainable per mile of cable laid is necessarily greater than can be the case in the sparsely populated rural areas. They also agree that, in order to enable supplies, at a commercially remunerative price, to be given in rural areas, every possible economy must be exercised in regard to capital expenditure on transmission and distribution. Some interesting figures regarding the relative costs of overhead lines and underground mains are given in the memorandum. It is mentioned that the cost per mile of a medium voltage (400 to 230 volts) overhead distributing main ranges from £400 to £800, according to the size of conductor used, and hence the amount of energy that can be transmitted by it. On the other hand, the cost per mile in the case of corresponding underground cables ranges from £1300 to £1850. For high-tension transmission —say, at 11,000 volts—the cost per mile for overhead lines would range from £500 to £900, according to the size of conductor, as compared with a range of from £2600 to £2700 for corresponding underground mains. The Commissioners point out that it is evident from this that the substantially higher cost of underground distribution interposes a serious, and in many cases absolute, obstacle in the way of electrical development in rural areas, and, in consequence, the liberal use of overhead lines, together with the best possible facilities for their erection, is essential if rural communities are to have a supply of electricity. It is considered by them that local authorities would expedite development if they would give general approval to the erection of overhead lines in their district, and leave any question arising on specific works to be settled subsequently, when the supply authority gives the necessary notice of intention to carry out such work. It is also urged that, despite the fact that the Minister of Transport can grant compulsory wayleaves and fix terms and conditions therefor, supply authorities should endeavour to secure by negotiation such wayleaves as may prove necessary for the development of their undertakings, having regard also to the possibility of reasonable alternative routes being available. The Commissioners submit that there is a growing public demand for supplies of electricity being made available as speedily as possible in rural areas; but progressive development of this character will only be possible if a due balance is preserved between the claims of utility on the one hand and of amenity on the other.

Small Price Increases per Unit Total-Up.

In Sheffield, there are murmurings regarding the price of electrical energy for domestic purposes. When it is used for heating, people are finding out what a difference even the fraction of a penny makes to the total cost. A therm in electricity is the equivalent of 29 units, and 29 farthings make an increase per therm of 7½d. Of course, the higher price in Sheffield is due to the necessity for wiping-off the deficit occasioned by the cost of fuel during the coal stoppage. The "Sheffield Telegraph" states that a large number of people are perturbed by the cost of electricity in domestic service. One correspondent who has substituted electricity for coal and gas says that he expects his bill this year will be about double. His annual cost for coal and gas for lighting, heating, laundry, &c., was about £18 to £20; but he estimates that his bill for electricity will be about £40. There is no doubt a grave mistake was made in not increasing the price during the stoppage, in order to recoup the higher expenditure for fuel. In Sheffield, the price of current was only raised at the end of the December quarter, in order to liquidate the increase in outlay of £120,000 which the Department incurred by having to buy coal at much enhanced prices during the stoppage. The higher payment by consumers will have to continue until the accounts of the Department again balance.

Domestic Water Heating.

Mr. John H. Parker, in an article in the "Electrical Review," will be found unpleasantly frank by some electrical engineers who think that a profitable night load can be developed by charging a price about equal to the fuel cost for the energy supplied to an immersion heater fixed in an ordinary domestic water-tank. Such tanks cannot be properly lagged, and are usually connected to a lot of pipes, which act as "condensers" of hot water. There is a fine brand of sarcasm in this picture of what some electrical enthusiasts are doing. Such business cannot be really "profitable" to the undertaking; and it is most unprofitable, through heat losses and the inconvenience of limitation, to the householder. Mr. Parker's view is that the sensible way to provide hot water electrically in an existing house is to instal properly lagged water-heaters, controlled by thermostats, at the sink and in the bath-room; and, even at 1d. per unit, water heating by such means, he asserts, will be found a commercial proposition. We could mention, but will leave readers to make a guess at them, two other systems of water heating which will give a larger range of thermal service at a lower cost. However, a few details regarding the plan advised by Mr. Parker will be of interest. He suggests that a 1½ gallon heater at the sink, with a 500-watt loading (1706 B.Th.U. per hour) will give all the hot water required; the thermostat should be set high (about 190° Fahr.), so that the water is too hot for washing either hands or dishes under the tap, which is wasteful. This shows the refined care that has to be taken in the use of water heated by the valuable heat units of electricity. The heater should also be of tinned copper, so that the water is suitable for cooking or filling the kettle. Such a heater costs less than £6. For baths an 11-gallon heater is recommended, with a loading of 1000 watts (3412 B.Th.U.). It is clear that, if a proper bath is required, the 11 gallons of water would have to be heated to somewhere about boiling-point, in order to mix with it sufficient cold water to get the necessary quantity and temperature of water for a bath for an adult. This is obvious; and Mr. Parker agrees when he writes: "This enables children to have a bath; and four hours later the water is up to full heat for another bath. A good hot bath requires 4 units; and, at a penny per unit, it costs 4d." But just fancy having to wait four hours before a second person can have a bath! Where there are half-a-dozen people in family, all requiring a morning bath, Mr. Parker's scheme would be unworkable, and the subject of execration. Obviously, however, he is no believer in giving half-a-dozen people the facility for having a bath one immediately after the other; for he says that he tries to deter people from having larger heaters fixed than the 11-gallon size. This is his reason: "My experience is that, with hot baths always available, the water is in constant use; and the bill at the end of the quarter gives the consumer something of a shock." In other words, in order to get business for electricity, control should be placed over the actions of people in the matter of personal cleanliness, and the frequency with which they take a bath.

When Bulk Supply Comes.

A point is then raised which has been the subject of comment in our columns since the Government electricity scheme was introduced. When large quantities of hot water are required, it would be necessary to supply it as a night load at very low charges; but Mr. Parker advises that, before engineers begin to build-up this type of load, they must carefully consider how they are going to supply it in a few years when they are taking a bulk supply. In his own case (West Hartlepool), his total load factor is only 30 p.ct.; and energy (high pressure) that he buys in bulk costs 0·66d. per unit. How can he sell cheap night-load energy when he has to pay 0·66d. for every high-pressure unit bought, including those used in conversion and distribution. Dare any of the 300 or 400 engineers who are going to purchase in bulk during the next few years, at a price based on the over-all load factor of the station, invest money in water-heating equipment to build-up a night-load at something a little above fuel cost? He thinks this is an inglorious ending to 25 years' electrical development. It will, of course, be difficult to justify the wide differential prices now obtaining when electrical energy is purchased in bulk at a flat rate. The "load factor," so long useful in connection with local generation, will be a disappearing consideration; seeing that the load factor is going to apply only to the super station, and will not apply to any particular supply district. Commenting on the point, the "Electrical Review" says:

> As the author points out, the very low off-peak tariffs which can be quoted for heating water during the night, on the basis of individual load factor, with advantage to both consumer and supply authority, will no longer be practicable when the authority is required to pay for electricity on the basis of its average load factor. This is a very serious matter; and it is desirable that, if possible, it should be considered before the Board commences commercial operations. It may be observed that, while the Act of 1926 prescribes the mode of framing the tariff for bulk supply to authorized undertakers, to consist of a "fixed kilowatt charges component" and a "running charges component," authority is also given to the Board to frame the tariff "in such other manner as may be determined by an order of the Electricity Commissioners," subject to the veto of either House of Parliament. Hence, if a system of charging can be devised which overcomes the difficulty indicated by Mr. Parker, it will be possible to bring it into operation without further legislation.

Centralized electricity generation and local tariffs are evidently going to clash severely.

Mishaps.

Ronald Williams (aged 15), son of the Matron of the Scattered Homes of the Newport (Mon.) Board of Guardians, was found electrocuted in his bedroom on Tuesday last week. In his mouth was a piece of flex attached to a wireless apparatus, and in one hand was a length of electric lamp flex. Apparently he had placed one hand on an iron bedstead while testing the wireless apparatus; but, owing to the insulation of one of the wires being defective, he received an electric charge, which proved fatal. It is stated that the voltage was 200. Last Thursday two miners were electrocuted while working coal-cutting machines at Rosehall Colliery, near Airdrie. From Timblin, Penn., comes the information that six men were electrocuted near there, on the 1st inst., through coming into contact with a high-tension cable. Last Sunday week there was a failure of the electric light and the discovery of a fire at the back of the switchboard at St. Matthew's Church, Rhymney (Mon.). Fortunately the flames were extinguished before much damage was done.

"B.C.G.A." SOUTHAMPTON PROGRAMME.

The following is the official programme for the Sixteenth Annual General Meeting and Conference of the British Commercial Gas Association, which is to be held at Southampton, on Monday, Tuesday, and Wednesday, Oct. 3, 4, and 5, under the Presidency of Sir Russell Bencraft, M.R.C.S.E., J.P., Deputy Chairman of the Southampton Gas Light and Coke Company.

ORDER OF PROCEEDINGS.

Monday, Oct. 3.

Evening.

7.15 for 7.30 p.m. Dinner on board R.M.S. "Majestic," by the courtesy of the Directors and Managers of the White Star Line, and by invitation of the Chairman and Directors of the Southampton Gaslight and Coke Company, to the President-Elect, Vice-Presidents, and members of the "B.C.G.A." and visitors.

Reception of guests by Chairman, 7.15 p.m. Evening dress. Decorations will be worn.

Tuesday, Oct. 4.

Morning.

Business Conference.

In the Royal Pier Pavilion.

10.30 a.m. Assembly of members.
10.45 a.m. Welcome by His Worship the Mayor of Southampton (Alderman P. V. Bowyer).
Presentation of Annual Report and Statement of Accounts by the Executive Chairman, Mr. F. W. Goodenough, C.B.E.
Presidential Address by Sir Russell Bencraft, M.R.C.S.E., J.P.
12.45 p.m. Adjournment for luncheon.

Afternoon.

Business Conference.

In the Royal Pier Pavilion.

2.45 p.m. Assembly of members.
3. 0 p.m. Opening remarks by the President of the Conference.
Address by Miss Gladys Burlton, B.A. (Lond.) (Principal of the Burlton Institute, London), on "Salesmanship in the Showrooms."
Discussion.
4.30 p.m. Adjournment.

Evening.

Reception and Lecture.

In the Royal Pier Pavilion.

8. 0 p.m. Reception by His Worship the Mayor of Southampton (Alderman P. V. Bowyer) and the Mayoress.
8.30 p.m. Lecture by Sir Bruce Bruce-Porter, K.B.E., C.M.G., M.D. (one of the Founders of the New Health Society), on "New Health: The Importance of Health in Industry."
9.15 to 10.30 p.m. Light Refreshments. Music.

Wednesday, Oct. 5.

Business Conference.

In the Royal Pier Pavilion.

10. 0 a.m. Assembly of members.
10.15 a.m. Opening remarks by the President of the Conference.
Paper by:
Mr. Ralph Halkett (General Manager and Secretary, The Sheffield Gas Company) on "The Commercial Prospects and Future Co-operation of the Gas Industry."
Discussion.
Memorandum from Executive Committee as to the present position in regard to the inclusion of "Flueless Rooms" in modern homes.
Report of Special Research carried out on this subject by Mr. Arthur H. Barker, B.Sc., B.A., Lecturer in Heating and Ventilating Engineering, University College, London.
Discussion.
12.45 p.m. Adjournment.
1.0 for 1.15 p.m. Luncheon at the South Western Hotel by invitation of the President-Elect, the Vice-Presidents, and members of the Association to the President of the Association and the Chairman and Directors of the Southampton Gaslight and Coke Company.

CLOSE OF CONFERENCE.

AN INVITATION.

The works and showrooms of the Southampton Gaslight and Coke Company are open to the inspection of members of the Conference, who are cordially invited to visit them at any time during their stay in Southampton.

Valuation for Rating of Plant and Machinery.

An Order dated May 30, 1927, known as "Statutory Rules and Orders, 1927, No. 480," has been made by the Minister of Health under Section 24 of the Rating and Valuation Act, 1925, which affects the rating of premises where machinery and plant of the classes and descriptions referred to in the Order are installed. The Schedule sets out, under Class I. (*a*), accessories used in connection with the generation, storage, primary or main transmission of power in or on the hereditament—such as steam-boilers, furnaces, accumulators, dynamos, transformers, cables, switchboards, &c. Under Class I. (*b*) a list is given of machinery and plant used or intended to be used for heating, cooling, ventilating, lighting, draining or supplying water, including tanks, pumps, hydrants, &c., for protection from fire. There is also a schedule of plant and machinery used or intended to be used mainly or exclusively in connection with the handling, preparing, or storing of fuel required for generation or storage of power, such as cranes, shafting, conveyors, &c. Class 2 includes lifts and passenger elevators. The paper is published by the Stationery Office at 2d.

REMOVAL AND RECOVERY OF TAR ACIDS FROM AMMONIA STILL EFFLUENT BY MEANS OF ACTIVATED CARBON.

[Contributed by Robinson Bros., Ltd., of Ryder's Green, West Bromwich.]

In publishing a lengthy abstract of a paper on the above subject in your issue of April 6 of this year, you justly remarked that the investigation could but be regarded as incomplete. Possibly, therefore, your readers may be interested in a summary of further work that has been carried out in the continuous apparatus mentioned briefly at the end of that paper.

In the first place, the difficulty of obtaining supplies of a suitable activated carbon has been overcome, for supplies of such a carbon are now available in commercial quantities. This new carbon, which is manufactured by a British firm in this country, is very much more active with regard to phenols than any other carbon that we have examined—incidentally almost all the known commercial carbons and many experimental carbons have been tested. In addition to being extremely active, the carbon is considerably less costly than most other carbons of half the activity.

Briefly, the process as now developed consists in treating the liquor with carbon dioxide or other acid until acid to litmus, allowing to settle, and running through a series of adsorbers containing the carbon. The adsorbers are cut out in turn, freed from phenols by steam distillation, and then returned to circuit. Any carbon lost during steaming is made-up with fresh carbon from time to time. A large portion of the tar acids is recovered as liquid tar acids, and a further portion as a 3 to 4 p.ct. solution, which is returned to the adsorbers.

In the accompanying table there are to be found the summarized results of six continuous runs carried out on liquors from different types of carbonization plant. It will be noted that in every case phenols are removed to the extent of over 99 p.ct. Reduction in oxygen figure depends considerably on the original thiocyanate content of the liquor; for thiocyanic acid is removed less easily than the phenols. The process could, however, be modified to give practically 100 p.ct. reduction of thiocyanic acid. But this is a phase of the process that has not yet been fully worked out; thiocyanic acid being far less harmful than phenols, and the process being originally designed for the removal of the latter only.

In connection with costs, it may be mentioned that it is very difficult to obtain any idea of corresponding costs by sewage treatment; but in one case figures have come to our knowledge which represent a cost of 0·226d. per gallon for treatment by sewage plant. Plant for treatment by the carbon method would be small compared with the necessary sewage plant. For example, to treat 200 gallons an hour, the minimum number of adsorbers necessary would be four, and each would have to be large enough to hold only 50 lbs. of carbon. In practice, spare adsorbers would naturally be added; and probably it would be wise to increase the size of each to give a factor of safety.

From a single observation, it would appear that the "devil" liquor, although containing a far higher percentage of phenols, is much more easily treated than the effluent liquor; but further observations on other types of liquor will be needed to decide whether this is of universal applicability.

In conclusion, it may be stated that any type of liquor may be freed from phenols by the carbon process, but that the cost will vary with the type of liquor, and not with the phenol content. The process is, in fact, favoured by a liquor of high phenol content.

Type.	Particulars of Liquor Treated.			Effect of Treatment. Percentage Reduction of—			Cost of Treatment per Gallon.		
	Phenols, P.Ct.	Oxygen Absorbed per 100,000, 4 Hours.	Thiocyanic Acid, P.Ct.	Phenols.	Oxygen Absorbed.	Thiocyanic Acid.	Cost of Carbon.	Value of Tar Acids Recovered.	Difference.
							d.	d.	d.
A.—Mixed	0·38	795	0·174	99·9	66·8	12·7	0·157	0·045	− 0·112
B.—Horizontal	0·24	445	0·103	99·9	71·4	10·5	0·0224	0·026	+ 0·0036
C.—Continuous Verticals with Steaming	0·14	921	0·487	99·3	35·95	7·6	0·127	0·005	− 0·122
D.—Coke Oven	0·165	277	0·0095	99·75	87·4	*Nil*	0·0106	0·029	+ 0·0184
E.—Low Temperature Continuous Verticals with Steaming	0·144	294	0·0083	99·9	88·0	29	0·0179	0·0266	+ 0·0087
F.—Continuous Verticals with Steaming. (Different from C)	0·407	705	0·083	99·5	87·3	15	0·0884	0·045	− 0·0434

RADIO WARNING OF BREAK IN MAIN.

As the result of an unusual accident, between 40,000 and 50,000 persons in the Roxborough-Manayunk suburbs of Philadelphia were on a recent occasion without gas for from ten to eighteen hours. As the result of necessary blasting-out of some solid rock in connection with sewer construction work, a 6-in. gas main was broken, as well as a water main of the same size. The excavation quickly flooded, and the gas main, which connected to the 20-in. feeder main to the district, about 100 ft. lower in elevation, drained the water from the excavation into this larger main. Before the water could be shut-off, enough of it had run into the 20-in. pipe to seal it off at a low point, thus stopping the supply of gas to the district.

According to an account appearing in the "American Gas Association Monthly," the accident occurred shortly after 3 p.m.; and before 5 o'clock Mr. W. H. Gartley, Chief Engineer of the Philadelphia Gas-Works, and Mr. Walton Forstall, Engineer of Distribution, had marshalled their supervisory forces, and approximately 300 men from all sections of the city were on the job making preparations to re-gas the isolated area. Mr. Gartley decided to take no chances, and issued instructions that each of the 9000 meters should be turned-off before the mains were pumped. This was done by about 9 o'clock, when the pumping was started. In order to avoid an explosive mixture getting into the mains, due to air being sucked in through open street-lamp burners, which are of the automatic type, or through the open burners of consumers' appliances, a slight gas pressure was kept on the main as the water was being pumped out. Approximately 7000 gallons of water were removed from the main system before the work of turning-on could be started. It was then decided that it would be impossible to turn-on before midnight; and rather than disturb consumers late in the night, this work was postponed until early morning. Restaurants, bakeries, and other large consumers were turned-on first; and before noon every consumer had gas service, each house or building having been inspected to see that no gas burners were open before the gas was turned-on.

A Novel Wireless Message.

Through the courtesy of the radio stations, the U. G. I. Publicity Department were able early in the evening to advise the consumers of what had happened, and what precautions to take. After explaining the circumstances, the message broadcast continued: "Gas consumers in the district are requested by the U. G. I. Co. immediately upon receipt of this notice to see that all gas-consuming appliances are turned-off. U. G. I. men from all sections of the city are working to clear the mains. A U. G. I. man will visit each house before gas can be turned on." Also through the Publicity Department the newspapers were given the facts of the case, with the result that writers without exception complimented the U. G. I. management on handling a difficult situation in a workmanlike manner.

Poppy Day Report for 1926.—The report of Earl Haig's British Legion Appeal Fund for 1926 reveals untiring energy in the best of causes. A vast amount of invaluable work has already been accomplished; and the public must see to it that a continuance of this good work, in ever-increasing extent, is made possible by the generosity of their contributions on Remembrance Day (Nov. 11).

MEETING OF THE BRITISH ASSOCIATION.

As will have been gathered from our previous notices, the meeting at Leeds of the British Association for the Advancement of Science, under the Presidency of Sir Arthur Keith, M.D., LL.D, F.R.S., did not contain a large number of matters of interest to "Journal" readers. Before referring to the subjects of interest—the principal of which was the discussion on coal on Friday, Sept. 2—we reproduce the message sent by H.R.H. the Prince of Wales as retiring President; the Prince being unable to be present as he is still in Canada. Sir William Bragg, F.R.S., has been elected President for next year's meeting in Glasgow.

MESSAGE FROM THE PRINCE OF WALES.

My year of office as President of the British Association has come to an end; and I can only express my regret to the members of the Association, and to our hosts the City and University of Leeds, that I am unable to attend personally in order to take my leave.

At Oxford last year I ventured in my address to lay before the meeting a view of the relations between Science and the State. I felt subsequently some justification for having chosen this topic, when I observed in the proceedings of the Imperial and Colonial Conferences of the past year the extraordinary emphasis laid upon the value of scientific research in relation to Imperial development. Both conferences set up special Committees on research; and we cannot but believe and rejoice that the foundations of an Imperial scientific service are being firmly laid. The Prime Minister of Australia indicated "the application of science both to our primary and secondary industries" as "the most important thing for Empire trade." More recently our ex-President, the Earl of Balfour, invited the attention of the House of Lords to "the enormous value of the work given by men of science, with the most lavish generosity," to the study of problems of the common welfare.

Such events as these place it beyond doubt that one of the main objects of the British Association itself is in process of achievement—namely, that of "obtaining more general attention for the objects of science." The Association, the so-called Parliament of Science, is one of the chief instruments to that end; and I trust that the public support will continue, in increasing measure, to be accorded to its work. Its powers, I am happy to say, have been very materially strengthened, during my own term of office, through the splendid generosity of Sir Alfred Yarrow, in making a gift of £10,000 for the general purposes of the Association, to be expended, in accordance with his wise provision, in the course of twenty years. I gladly take this opportunity of publicly repeating the thanks of the Association to Sir Alfred Yarrow.

In resigning the Chair to Sir Arthur Keith, I can wholeheartedly congratulate the Association on its choice of my successor. His name stands very high in the science of man's origin and early biological history. I have reason to believe that, when anyone in this country digs up a bone, his first instinct (subject to the intervention of the police) is to send it to Sir Arthur Keith. You are to hear from him an address on Darwinism as it stands to-day—a subject of perennial interest, and more than once one of warm controversy at our own meetings. The occasion of the Presidential Address does not (I am thankful to say) lend itself to controversy; but the warmth I am sure you will supply in your welcome to Sir Arthur Keith, and meeting as you are in Leeds, will be increased by the traditional quality of Yorkshire hospitality.

DISCUSSION ON COAL.

On Friday, Sept. 2, Section G (Engineering) considered the question of coal. The discussion was opened by Dr. C. H. Lander (Director of the Fuel Research Station of the Department of Scientific and Industrial Research) and Prof. J. W. Cobb (Professor of Fuel Technology, Leeds University), both of whom dealt with our available coal supplies and their utilization; while Prof. R. V. Wheeler discussed the chemistry of coal.

DR. C. H. LANDER.

Dr. C. H. LANDER said that during the past 300 years the fuel which had in particular enabled the standard of living of all classes to be improved almost beyond recognition was coal; and it might justly be claimed that through the utilization of this material the poorest of us was in a position to obtain comforts and luxuries undreamt of even by the wealthiest in former generations. In the past Great Britain—a pioneer in coal production—had been in a very favourable position, owing to the early working, wide variety, and high quality of the enormous stores of coal in her possession. The world's chief source of fuel was, and must long continue to be, found in the vast and widely distributed accumulations of coal; but other fuels which had been exploited during recent years were tending gradually to place Great Britain in a less favourable position, and to put her at a disadvantage with competing nations. This state of affairs was emphasized by the fact that certain of her commercial rivals had themselves large stores of coal which were now being worked to a much greater extent than during the last century.

The output of coal in Great Britain might be taken roughly at 260 million tons per annum, of which some 80 million tons were exported. The remaining 180 million tons were retained for home use. The following table, from the Fifth Annual Report of the Secretary for Mines, gives an approximate indication of the purposes to which it was put in the years 1924 and 1925:

Consumer.	1925. Tons.		1924. Tons.	
Coke ovens (metallurgical coke):				
Total quantity	16,394,000		18,862,000	
Less equivalent of coke exported	1,825,000		2,717,000	
Net home consumption		14,569,000		16,145,000
Gas-works:				
Total quantity	17,799,000		18,104,000	
Less equivalent of gas coke exported	1,347,000		1,440,000	
Net home consumption		16,452,000		16,664,000
Manufactured fuel:				
Total quantity	1,124,000		1,088,000	
Less equivalent of manufactured fuel exported, or shipped for use of steamers engaged in foreign trade	1,072,000		975,000	
Net home consumption		52,000		113,000
Electricity generating stations belonging to authorized undertakings and to railway and tramway authorities		8,250,000		7,701,000
Railway companies (for locomotive use)		13,357,000		13,512,000
Vessels engaged in the coastwise trade (bunkers)		1,162,000		1,265,000
Blast furnaces (pig iron manufacture) exclusive of metallurgical coke included above—viz., 7,465,600 tons in 1925, and 8,608,900 tons in 1924		886,000		1,376,000
Collieries (engine fuel)		15,416,000		16,574,000
Domestic coal, including miners' coal (approx.)		40,000,000		40,000,000
General manufactures and all other purposes		59,420,000		67,010,000
Total		169,570,000		180,360,000

The various headings could be considered in two groups, according to whether the coal was subjected to some pre-treatment before being finally burned, or burned in its raw state. The chief two industries in the former group were the coking industry and the gas industry, who together consumed from 35 to 40 million tons; leaving in the latter group 140 million tons, which were used in the raw state. The requirements of industry in the direction of fuel were so varied as to render it impossible to lay-down any single ideal method of utilization; but, having regard to the large quantity of coal burned in the raw state, it was legitimate to consider whether improvements in utilization could not be effected by the wider adoption of methods of pre-treatment. It was a mistake to assume that it was fundamentally uneconomical to use coal in the raw state, since the products obtained by pre-treatment were in the main themselves ultimately burned. If, however, it could be shown possible to split-up the coal into such products as could be utilized with greater commercial efficiency than could the raw material, savings might be effected; but these savings must be sufficiently great to compensate for the inevitable loss of heat units involved in any process of pre-treatment.

At present liquid fuels were required in large quantities for land, sea, and aerial transport, but were procurable only from overseas. Thus our national defence was entirely dependent upon a fuel which had to be imported. He hesitated to put forward the following figures, since the whole subject was so complicated that they presented only a portion of the picture; but if the remaining coal in Great Britain could be taken as 180,000 million tons, and if it were assumed that 10 gallons of oil per ton could be extracted from this coal, we had actually in the country 1,800,000 million gallons of oil—a supply far exceeding the estimated petroleum reserves of the whole of the United States. Looked at from the fundamental point of view, it was surely somewhat Gilbertian to import nearly 2000 million gallons of oil a year when such vast supplies lay dormant in the country. Since, however, oil obtained from coal must at present be regarded as a bye-product, it did not follow that the production even from the whole of the coal raised in the coun-

try would make it possible to do altogether without imported oil. But it was obvious that the present situation could be considerably eased by the institution of methods whereby pre-treatment of coal could be carried out economically in a much widened field.

The desirability of improving the present position was further emphasized in view of the vast amount of damage to property, and possibly also to health, which was caused by smoke. It had been estimated that in Manchester the damage by smoke exceeded £750,000 per annum. For London, Russell a few years ago had given a figure of £1 per head per annum; and in Pittsburgh careful investigation in 1913 had led to an estimated loss of £4 per head. Again, the Samuel Commission had pointed out that the work of over a million miners for three days every year was devoted to providing the soot which polluted our atmosphere.

From the table, it was impossible to gather what proportion of coal was utilized in industry for power production as differentiated from the production of heat; and there were no data yet available from which this item of fundamental knowledge might be deduced. When a fuel was required for power purposes, it could only be used with a thermal efficiency which was comparatively low (say, an average of 20 p.ct. in a steam turbine); the remainder of the heat being dissipated in condensing water, &c. On the other hand, when fuel was required for heating purposes, its efficiency of utilization might be very much higher—perhaps three times as much as the example cited. It would be seen, therefore, that if it were possible to make an accurate estimate for the country, or even for some particular district, of the proportions in which fuel was used for these two purposes, a much better conception might be formed of the degree to which it might be subjected either to carbonization processes or to the production of electricity. There were, of course, many instances in which useful supplies of electricity might be generated as a bye-product, if large quantities of heat were also required as such—say, for carrying out chemical processes.

It was obvious that our fuel utilization was, to say the least of it, imperfect; and it must be emphasized that there were means available whereby great improvements could be made. Far more knowledge now existed for the improvement of both thermal and commercial efficiency than was available during the last century; and this knowledge should be applied to a very much greater degree than was the case at present. As the late Sir George Beilby had stated, the outstanding feature of the situation appeared to be that, while, on the one hand, there already existed among experts a widespread knowledge of means whereby the extravagant methods of consuming fuel which were widely prevalent might be so improved as to reduce the consumption for industrial purposes by a very substantial amount, there was, on the other hand, still so much inertia on the part of the consumers that even the simplest and most obvious steps towards improvement were not taken.

Discussing briefly the work of the Fuel Research Board, which was instituted in 1917, Dr. Lander said it had had perforce to attack the fuel problem mainly from the industrial point of view. It was an unfortunate fact that our fundamental knowledge of the behaviour of coal when subjected to various treatments was yet so incomplete as to render it imperative that a great deal of work should be done upon plant of full-unit scale. The bulk of the work undertaken at East Greenwich, therefore, was of the large-scale type—such as the development of improvements in methods of carbonizing in gas-works plant; experiments on boiler firing, using full-sized boilers; investigations into different systems of coal cleaning, using for the purpose full-scale units of typical coal-cleaning plant; and so on. There were, of course, well-equipped laboratories, which were used for purposes of works control, and also for such fundamental inquiries as were essential to ensure the most fruitful results being obtained from the full-scale plant. In spite of this, however, the bulk of fundamental work as such must be left to outside workers. The present deficiencies were continually being felt in the full-scale investigations.

Giving instances of cases where difficulties had arisen through lack of basic information, he said that some time ago a carbonization process was suggested in which the coal was ground, heated to a temperature at which it became plastic, and finally briquetted at this temperature. Using the most reliable information existent, it was concluded in the laboratories—and, indeed, was shown on a laboratory scale—that if the coal were subjected to temperatures of 360° C., robust briquettes should result from most coals at a pressure of 2 tons per sq. in. When, however, this was applied to large-scale working, incipient decomposition was found to occur long before this temperature was reached; and this caused grave difficulties in the large-scale plant. On this account, further work was instituted in the laboratory; and it was discovered that the decomposition point of coal started—and, indeed, became serious—at temperatures more than 100° lower than had previously been believed. It was apparent that this information had bearings in many other cases than that of the particular process referred to—for instance, that of direct briquetting at elevated temperatures, or any processes where preliminary heating or drying was applied.

The recent work of Bergius and others on the hydrogenation of coal at high pressures and temperatures, while of the greatest importance as pointing a possible way of obtaining oil in large quantities from bituminous and other coals, was also likely to have an important bearing on our knowledge of the constitution of coal. Recent work at the Fuel Research Station had shown the possibility of conferring, by hydrogenation, marked coking properties on coals otherwise absolutely devoid of coking power. He exhibited a sample of coke made from non-coking coal without the addition of any substance other than an extremely small proportion of hydrogen. The importance of the field opened-up for investigation in this direction, he said, could not be over-estimated. Another important direction in which further knowledge was required was the selective effect of various reagents, temperatures, pressures, or processes on different coal constituents.

Investigations carried out recently in several quarters had indicated that the inorganic constituents of coal could not be taken as merely inert diluents. Some of these constituents had a marked effect on the behaviour of a coal or coke when carbonized or burned; but much work remained to be done before we should know which constituents had that effect. This led to a consideration of methods of purifying coal. After a coal had been through a cleaning process, the ash-forming constituent would not only be reduced, but its composition would also differ from that originally present; and it might well happen that this change was of importance. The methods of cleaning coal had developed by trial and error; and little was known as to the real basis underlying some of the processes. Here, again, was an opening for valuable investigations; and the problem was being taken up at the Fuel Research Station and elsewhere.

It had been found that the size of coal charged into retorts and coke ovens had a marked effect on the products, or on the ease of working, partly due to its effect upon the transference of heat to the charge. Physicists could tell us something of the laws governing heat transference by conduction, radiation, and convection to and through more or less homogeneous bodies; but coal was such a heterogeneous mixture, and the conditions of heat were so complicated, that theory alone could not be relied upon.

Were the investigation of all the problems so far touched upon more advanced than was actually the case, we should still be unable to apply our knowledge satisfactorily without a detailed knowledge of the individual coals. It was well known that different coal seams varied widely from each other in their properties. What had been perhaps less fully realized was that in nearly all cases the different layers in a single seam, even if only a narrow one, also differed widely from each other. These variations should be known in some detail before the method of mining, cleaning, grading, and blending best suited to the coal as it occurred, and the use to which it was to be put, could be stated. It was the object of the Physical and Chemical Survey of the National Coal Resources to provide information on this side. The Survey formed one of the most important activities of the Fuel Research Board, and was being pushed on as rapidly as the provision of the necessary staff and the frequent difficulties of the mining industry admitted.

Emphasizing the importance of systematic study in extending our knowledge of the constitution of coal, Dr. Lander said that in the past a large amount of so-called fundamental work had been of the nature of empiricism on the small scale, and had been of little, if any, value, or, indeed, had sometimes been positively misleading. Such work should be undertaken only by those who could free their minds from prejudice and view the matter in an impartial manner, taking into consideration the work of others who might be looking at the subject from somewhat different angles. It was of vital importance that a proper use should be made of our bountiful coal resources. In the first place, existing knowledge must be applied to a much greater extent than heretofore. Research work on the large scale would always be required; but the labour and expense of such work might be materially reduced in future by further knowledge of the fundamentals both of the materials and the processes. In this way, grounds for controversy would be removed, and the energies of those interested might be devoted more to work and less to talk than unfortunately was the case at present.

PROF. J. W. COBB.

Prof. J. W. COBB said that the ideal utilization of our coal supplies would necessitate the complete realization of the potential thermal and chemical values of coal without the emission of smoke. Burning raw coal was an obvious failure to realize the ideal; and we were at present in revolt against it. On the other hand, if coal were carbonized, the two principal products—gas and coke—were smokeless fuels, while the tar and ammonia were valuable chemical bye-products. Carbonization was a standard industry as carried out in gas-works and coke ovens; and there were other well-known processes of gasification. The position at present could be stated thus: In 1924, according to the report of the Secretary for Mines, the allotment of 180 million tons of coal available for home con-

sumption was approximately 16·7, 7·7, and 100·3 million tons for gas-works, electricity generating stations, and domestic use respectively, and for the carbonization industries taken together—gas-works and coke ovens—32·9 million tons.

Discussing the factors at present limiting the applications of carbonization or similar processes to the great bulk of our coal supplies, and what is being done or might be done to remove these limitations, Prof. Cobb said that one feature common to all such processes of treating coal before burning it was that they entailed thermal and monetary expenditure; and the success of the treatment under ordinary economic conditions depended upon whether the expenditure was justified by the enhanced value of the products. Unless that condition was satisfied, the wide and increasing adoption of a process was impossible. The enhancement in value of the products had been sought in several ways. If a valuable bye-product with a ready market was forthcoming in large quantities, that might, in itself, justify the process. Thus the large yield of liquid fuel obtainable by such a process of hydrogenation as that of Bergius might cover the cost of hydrogen and the provision and working of an apparatus which had to be maintained hot under enormous pressure. Again, the motor spirit obtainable from our own coal supplies might be sufficiently valuable to justify a catalytic treatment of water gas and hydrogen, necessitating, as a preliminary, carbonization of coal and gasification in steam of the resultant coke. The Mond process of gasifying coal in steam and air was largely based on the very high yield of sulphate of ammonia obtainable. Such dependence upon the value of a particular chemical bye-product was not, however, a feature of the normal process of carbonization and gasification as carried out in gas-works, coke ovens, and producer plants.

Examining the position in these various respects, Prof. Cobb, beginning with carbonization, and taking thermal efficiency first, said that the carrying out of this process did not necessarily involve any large expenditure of the potential heat of the coal carbonized. In a gas-works, for every 100 heat units contained in the coal, 75 to 80 should be available in the gas, coke, and tar produced after heating the retorts with a portion of the coke. In the most modern plants, using waste-heat boilers, from 80 to 85 p.ct. efficiency had been obtained. The immediate thermal expenditure of (say) 20 p.ct. in the process did not, however, represent an ultimate thermal loss, because it was more than covered by the greatly enhanced value for most heating purposes of each unit carried in the gas as compared with that of a heat unit in the coal. From the purely thermal standpoint, therefore, the gas industry was in a strong position, and its progress could be readily comprehended. Gas and coke went far to replace raw coal for most domestic and many industrial purposes; and they had other advantages, apart from thermal efficiency.

At the same time, one must recognize that, in replacing coal by carbonized fuel for many large uses, of which steam raising for electricity generation or other purposes might be taken as an example, a limit was imposed by the monetary cost of carbonization and gasification in its present form. The outstanding technical factor limiting the economies of carbonization seemed to be that of speed in operation. The burning of carbon by air at the temperature of a good boiler fire could take place at a speed limited solely by the rate at which air could be brought into effective contact with the carbon. Combination was, to all intents and purposes, instantaneous and complete. The position was quite different in carbonization, and even in such processes as the gasification of coal in steam and air in a producer for the manufacture of producer gas, or of coke in steam for the manufacture of water gas. There, the processes of heat penetration and the reactions of gasification were very much slower; and the consequence was that much higher expenditure on the plant and its working, per ton of coal, had to be incurred. It was not strange, therefore, that in one way and another a vast amount of work was being done to determine how these reactions of coal and coke, other than their direct burning in air, could be accelerated.

Considering carbonization from this point of view, it was pointed out that in an ordinary plant the heat had to be transmitted through the wall of a fireclay retort, and then through the mass of coal. It was a slow process. The retort, for high-temperature working, was made of fireclay of low conductivity. Heat, in penetrating the coal, was partially conducted by the solid particles, and partly radiated across spaces between the solid particles. Some heat was also convected from point to point of the charge by the gases evolved during carbonization. The condition of affairs was complicated, since it was not only heat transmission which was important, but also keeping the charge in such a condition that the volatile products might be evolved easily and escape as quickly as possible. Such considerations were responsible for much experiment in design and treatment. Narrower retorts or tubes had been tried, and fireclay substituted for the iron employed in the older days of the gas industry. At the same time, careful inquiry had been directed to find a type of iron which would not suffer from the growth and distortion which had ruined the old retorts. Other alloys, "Cronite," had been used experimentally with considerable success, as he could say from first-hand experience, although the cost of "Cronite" was too high to allow of its general use in large-scale work.

The use of metal as compared with such refractory materials as fireclay or silica had one disadvantage, however, in the sense that it imposed a much lower limit upon the temperature of the combustion chamber, which had the effect of lowering the temperature head available for rapid working. The present tendency in gas-works and coke oven practice was to use a high quality of refractory material, usually silica, in order to get as high a temperature head as possible between the combustion chamber and the charge. There was much to be said for seeking to produce the material sometimes known as semi-coke, containing a certain proportion of volatile matter, not by simply carbonizing of set purpose at a lower finishing temperature (what was usually understood by low-temperature carbonization), but by rapid incomplete carbonization at a high temperature. To bring this about, everything must be done to facilitate penetration of heat and the escape of volatile matter. The condition of the charge at every period of its carbonization should be the best possible.

The nature of the coal, its manner of fusion, the rate of escape of volatile matter, and the degree of its contraction and expansion, were all important. The transmission of heat by conduction through the solid depended directly upon temperature differences; but the radiation of heat across intervening gas spaces increased much more rapidly than the temperature. The heat transmission by conduction and radiation varied very much with temperature, and also with the size of gas spaces. Heat convection by the gases, as had been mentioned, came into play. Moreover, although the carbonization process, considered as a whole, did not either absorb or evolve appreciable amounts of heat, the reactions occurring at one range of temperature were markedly exothermic, and at another endothermic, which must have its effect on the heat transmission between the cooler and hotter portions of the charge—usually the inside and the outside layers.

The position was too complicated to allow of any satisfactory exploration except by direct and systematic experiment on the influence of each variable taken in its turn. Hence the need for the work which was on the way to determine the behaviour of coal of different kinds, caking and non-caking, swelling and non-swelling, the influence of the size of the pieces of coal used, either when one size alone was employed or sizes in admixture, the possibility of blending coals so as to secure better behaviour from a mixture than either would give separately—all these at different temperatures and rates of working. It was not sufficient simply to study what were the differences obtained when carbonization was complete, but also the larger differences which often manifested themselves earlier in the process, when only a partial carbonization had been effected, because such partial carbonization might be enough for many purposes, and, indeed, might be the only form of treatment economically practicable, for many uses.

Helpful results had been, and still were, forthcoming from such investigations; but more radical methods of speeding-up carbonization could be employed if the solid coke could be accepted in powdered form, as it could, for example, for the raising of steam by dust firing. The problem of heat transmission was enormously simplified in this case, because radiation and convection could be made so quickly operative upon the surface of every particle. Mr. Sinnatt, of the Fuel Research Board, had shown how each individual particle of coal responded to the stimulus of heat by the rapid formation of a little bulb or ceno-sphere. This principle was receiving large-scale investigation in the McEwen-Runge process, where the transmission of heat to each particle was facilitated, not only by the fine sub-division of the coal, but by causing the particles to descend through an ascending current of hot gas which acted as a heat carrier and carbonized them by direct contact. The imparting of heat by using a current of hot gas was a feature of several proposed processes. In another system—that of Piron—the heat was transmitted to the powdered coal by the contact of molten lead. Rapid carbonization in a revolving cylinder was carried out by Yeadon, of Leeds, in 1889, and was now being thoroughly tried-out.

Speaking of something more speculative in character, but nevertheless worthy of consideration, Prof. Cobb said it was open to them to make progress, not solely by an alteration of the thermal and mechanical treatment of coal, but by modifying, if they could, its chemical behaviour and reactivity. They need not assume that coal, as it had been naturally deposited, was in the best chemical condition for use, and that therefore there were no practical means of stimulating its reactivity—of inducing a different behaviour in carbonization from that natural to the coal as it was mined, and imparting, where desired, greater reactivity to the resultant coke.

Continuing, Prof. Cobb asked how far it was practicable to catalyze the reactions with which they were concerned in the carbonization and gasification of coal. Dr. Lessing had pointed out that the behaviour of coal on carbonization in the laboratory was affected materially by the presence in small quantities of many inorganic compounds; and Haber had suggested that the ash of coal might catalyze the reaction of gasification in steam. Further investigation had shown clearly that, if one considered such oxide constituents as commonly occurred in the ash of

coal, alumina and silica—which usually occurred in the greatest quantity—had little or no effect, but that lime, oxide of iron, and soda influenced materially the process of carbonization. This was very apparent on the laboratory scale, where much finer grained, stronger, and more homogeneous cokes had been produced by the addition of 5 p.ct. of these materials. The full explanation was not forthcoming; but it would appear that the evolution of volatile matter during the plastic stage was slowed-down, and the puffing-out and honeycombing of the coke lessened on that account. On the larger scale, these special cokes were, however, not obviously different in structure from pure coke made without additions—presumably because the process was so much slowed-down that the differences were smoothed-out. It was likely that in process of rapid carbonization on any scale they would be retained.

There were some interesting points in the larger scale results. Thus, the gas yield was increased 20 p.ct. with a sodium carbonate coke, and the ammonia yield 35 p.ct. with a calcium carbonate coke. But what was of greatest importance was the interesting change which had been brought about, on either the laboratory or the large scale, in the properties of the coke by these additions. Giving one or two illustrations, Prof. Cobb stated that on gasification in steam—the laboratory equivalent of the water gas process—the cokes made with alumina and silica additions behaved exactly like the pure coke; but the cokes made with lime, oxide of iron, and particularly sodium carbonate, behaved quite differently. They gasified much more quickly, and gave a much better water gas. Incidentally, it was pointed out that, as the rate of steam passage through a bed of red hot coke was increased, some of it began to come through undecomposed; and the water gas, instead of being practically all carbon monoxide and hydrogen, contained CO_2 in gradually increasing quantity. With the pure coke in the laboratory apparatus at 1000° C., using 10 grammes of coke, the gas made contained 5·2 p.ct. of CO_2 (taken as a permissible amount) when the rate of steam supply was 2·5 litres per hour and the coke was being gasified at the rate of 1·15 grammes per hour. With the silica coke the figures were practically the same. With the iron oxide coke, the rate of steam supply had to be increased nine-fold, to 21·9 litres per hour, with a coke gasification of 10·5 grammes per hour, before the CO_2 in the gas amounted to 5 p.ct. With the calcium oxide coke, a CO_2 content of 5·4 p.ct. was obtained with a rate of steam supply of 11·2 litres per hour, and a coke gasification of 5·2 grammes per hour. The figures obtained with sodium carbonate were even more remarkable. With a steam supply of 21 litres per hour, the CO_2 was only 0·4 p.ct.; and in order to get 5 p.ct. of CO_2 in the gas, it was necessary to make the column of coke only one-quarter of its original length.

It was evident from these figures that the reactivity of coke to steam was so far enhanced by the additions that the rate of working could be increased ten-fold or more without impairing the quality of the gas made. These results were obtained when working at a temperature of 1000° C. At lower temperatures, the influence of the added constituent was in some ways even more remarkable. It must be remembered that the maintenance of a temperature of 1000° C. in all parts of the fuel bed was not practicable in many gasification processes, and that, for example, with steam the rate of gasification fell-off rapidly with temperature, and the quality of the gas made was lowered by the production of more CO_2.

One of the most striking examples of the influence of an added constituent was obtained by the comparison of the behaviour at 800° C. of a pure coke and a sodium carbonate coke, with the steam supply at 10 litres per hour to 10 grammes of coke. With pure coke, 0·9 gramme of coke was gasified per hour, yielding a gas containing 18 p.ct. of CO_2. With the sodium carbonate coke, 5·8 grammes were gasified per hour; and the gas made contained only 1·7 p.ct. of CO_2, or six times the rate of gasification with only one-tenth the CO_2 in the gas. This enhanced reactivity of coke towards steam was obviously of direct importance for the making of water gas, and the steaming of coke in gas retorts, and also in nearly all gas producer practice where coal and coke were gasified in air and steam; since, even if the producer were charged with coal, as was commonly the case, expulsion of volatile matter at the top of the producer soon converted the coal to coke, and it was the gasification of coke which was responsible for the great bulk of the gas made. When, however, as in the gas producer blown with air alone, air was the gasifying agent, the fundamental limiting factor in the rate of gasification was the reactivity of the coke to CO_2. The rate of blowing with air could easily be increased with the production of CO_2 at the grate; but unless the coke above it could reduce that CO_2 to CO, excessive heat was generated in the producer, and largely lost, while the producer gas was high in CO_2 and of low quality.

Incidentally, it was pointed out that for those uses in which the generation of the maximum amount of heat in the fuel bed was required, the less reactive coke would be the better; but the requirements of gas producer practice were the opposite. As much heat as possible was wanted as potential heat of combustion in the gas leaving the producer. It was plainly, then, an interesting point as to whether the same stimulation of reactivity towards CO_2 could be secured in these special cokes as towards steam. This had been investigated; and it had been shown that the stimulation of reactivity in the special cokes towards CO_2 did occur, although in some cases there seemed to be a falling-off after a time, which had not been noted with steam. This was being further examined. Passing CO_2 over coke at 1000° C. under such conditions that pure coke gave only 47·8 p.ct. of CO, the iron oxide, lime, and sodium carbonate cokes gave 93, 95, and 97 p.ct. of CO respectively. Similar effects were obtained at lower temperatures. (The figures quoted above are in every case for 5 p.ct. additions; but experiments made with smaller quantities showed that useful effects could be obtained thereby in a more than proportionate measure.)

In bringing these particular results forward, Prof. Cobb emphasized that they were not intended to represent the working-out of a technical process or the completion of laboratory investigation. Nevertheless, they seemed to him to be suggestive, and to demonstrate that a mistake would be made if they did not keep their eyes fully open to the possibility of speeding-up the processes employed for the utilization of coal to an extent which it was quite impossible to forecast.

One great reason militating in practice against the replacement of the direct burning of coal by methods which would be more scientifically, economically, and hygienically satisfactory was that none of the other processes of transforming coal was anything like so rapid as that of direct burning. Consequently, much was being done, and more remained to be done, in investigating in the laboratory and on the large scale how the speeding-up might be effected. The investigation was necessarily taking many forms—through the design of apparatus and the study of the nature of coal in the molecule and in the mass, in order to understand its potentialities under many thermal and chemical conditions, and inquiry into the possibilities of modifying the properties of coal in directions found desirable by suitable conditions.

Gasification of Special Cokes in Steam and CO_2.

Coke Used.	Weight of Coke. Grms.	Gas Nature Entering.	Rate of Gas Entering Litres/Hr.	Rate of Coke Gasification. Grms./Hr.	CO_2 P.Ct. in Gas Leaving, Dry.	CO P.Ct. in Gas Leaving.	Temperature, Fuel Bed. °C.
"Pure"	10	Steam	2·5	1·15	5·2	..	1000
5 p.ct. Fe_2O_3	10	,,	21·9	10·5	5·0	..	1000
5 p.ct. CaO	10	,,	11·2	5·2	5·4	..	1000
5 p.ct. Na_2CO_3	10	,,	21·0	..	0·4	..	1000
	2·5	,,	21·0	..	5·8	..	1000
"Pure"	10	Steam	10·0	0·9	18	..	800
5 p.ct. Na_2CO_3	10	,,	10·0	5·8	1·7	..	800
"Pure"	10	CO_2	6·0	..	..	47·8	1000
5 p.ct. Fe_2O_3	10	,,	6·0	..	..	93·0	1000
5 p.ct. CaO	10	,,	6·0	..	..	95·0	1000
5 p.ct. Na_2CO_3	10	,,	6·0	..	..	97·0	1000
"Pure"	10	CO_2	6·0	..	..	14·0	900
5 p.ct. Fe_2O_3	10	,,	6·0	..	..	70·0	900
5 p.ct. CaO	10	,,	6·0	..	..	63·0	900
5 p.ct. Na_2CO_3	10	,,	6·0	..	..	82·0	900

(To be continued.)

GAS EXAMINATION PRIZE WINNERS.

Awards by the Society of British Gas Industries.

We have received from the Secretary of the Society of British Gas Industries (Mr. Arthur L. Griffith) the following list of winners of the prizes given by the Society in connection with the recent City and Guilds of London Institute examinations in Gas-Works Practice, Gas Supply Practice, and Gasfitting.

GAS-WORKS PRACTICE—MINOR COURSE.

First Prize, 5 Guineas.

Walter John Evans, examined at Bournemouth.

Second Prize, 2 Guineas.

Kenneth Edward Tiddy, examined at Bedford.

GAS SUPPLY PRACTICE—MINOR COURSE.

First Prize, 5 Guineas.

William Robert Slator Shadbolt, examined at East Ham.

Second Prize, 2 Guineas.

Kenneth George Ecclesbare, examined at Derby.

GASFITTING—FINAL EXAMINATION.

First Prize, 5 Guineas.

Llewellyn David Jones, examined at Acton.

Second Prize, 2 Guineas.

Francis George Craxford, examined at Birmingham.

A STUDY OF THE PHENOMENA OF ELECTROLYTIC CORROSION OF MAINS.

By A. BOLZINGER, Ancien Elève de l'Ecole Polytechnique, Chevalier de la Légion d'Honneur.

(*Continued from p. 501.*)

PART III.—PROTECTION OF MAIN SYSTEMS AGAINST STRAY CURRENTS.

We have seen how stray currents are established in the ground, and the effects which they produce in pipelines; and we will now examine the means of protecting pipes against the corrosive action of such currents. In this regard, there is at our disposal first the direct protection of the pipes against the currents which they are likely to gather; and, secondly, indirect protection, which consists in attempting to suppress stray currents by exacting some measure of observance of desired conditions by electricity undertakings.

It can be stated without hesitation that the second means is the most effective and the most logical, for it is obviously better to eliminate the evil at its source. We will, however, commence this part of the treatise by dealing with direct protection, for that alone depends solely on the gas man; the second specific only being applicable by vigorous legislation.

A.—DIRECT PROTECTION OF MAINS.

This can be carried out in several ways. Apart from the application of a protective coat, one can seek means of preventing the stray currents reaching and making use of the main, or, possibly, of conducting the stray currents along such a path as to render them harmless—thus to some extent making the pipeline part of the electrical grid.

1. *Paints and Protective Coatings.*—It has already been briefly stated that paints and dressings do not in general constitute an effective protection against electrolysis. A study of insulating dressings, &c., has been carried out by the Bureau of Standards of Washington; and the results are set out below.

Such material can be classified under four headings:

1. Paints applied at the ordinary temperature, the adherence of which depends on oxidation or the chemical action which they produce.
2. Coatings which liquefy at a high temperature, and which are applied by immersing the pipe in a bath (asphalt, coal tar, pitch, &c.).
3. Wrapping consisting of dressed hessian, &c.
4. Lagging consisting of an exterior shell enclosing a space filled with insulating material.

Experiments were first made in zones in which a pipe was positive (anode). The results of 32 paint samples were negative; and of 33 samples of dressings 82 p.ct. were insufficient, although their resistance was generally better than that of the paints.

The main difficulty of these paints and dressings is their faculty of absorbing moisture. They become more or less conductors, and electrolysis sets in with a production of gas, which impairs or cracks the skin. The electrolysis proceeds all the more rapidly at these weakened points, as the current concentrates there. Thus they become more of a danger than a protection; and the same may be said of insulating wrapping. Pipes protected by a continuous shell filled with pitch are more resistant, and this method could be used in certain special cases; but it is obviously very costly, and the results are not conclusive enough to justify employing it on a large scale. Thus the use of wrapping, paints, and dressings is really harmful in positive zones (anodic pipe). In negative zones where the current is into the pipe, such methods may be considered, but not as an effective remedy.

It has been shown earlier that certain chemicals have a tendency to render iron passive—that is to say, unattackable by a current; and a saturated solution of lime, when it is practically pure, is an effective protection against the depredations of stray currents of ordinary density. However, chlorides, sulphates, and carbonates utterly impair this property; and as these salts are always present in the subsoil, their diffusion into the lime will spoil the protection. It is for this same reason that pipes covered with a coating of cement (a method favoured in the United States) cannot be considered effectively protected. As soon as electrolysis commences, expanding forces develop, and fissure the cement.

2. *Insulating Joints.*—With the view of keeping stray currents away from a pipeline, various types of insulating joints have also been devised. Such joints are easily devised, but must be used in dry places where the ground is a poor conductor. Otherwise the current may leave the main before each joint, and rejoin it afterwards, whence corrosion will be set up.

We will not go into the details of such joints, beyond pointing out that they constitute points of discontinuity likely to give rise to sundry disorders; and the effect may be to shift known points of corrosion to unknown points, where much greater damage may be wrought. In practice, one must endeavour to visualize the consequence of employing the method, and only do so after a close study of the special circumstances of the case.

3. *Baffle Plates.*—When a point of corrosion has been identified, one can effectively protect the main by a baffle plate in electrical contact with it, and interposed between the main and the rail which acts as the return. The current, instead of leaving the main, departs by way of the baffle plate; and it is the latter which gets corroded, which does not matter. Unfortunately such protection can only be quite local, and by no means solves the problem; but it may be used with great advantage in the case of drastic local attack.

4. *Lowering the Potential of the Mains.*—Since damage is generally found at points where the current leaves the main—that is to say, since it occurs at positive points in respect of the ground or metal bodies in the neighbourhood—efforts have been made to give them a constant negative potential by interposing a dynamo, the excitation of which is fixed according to the current flow between the pipe and the rails or return main. We will not dwell on this method, the complexity and the expense of which are obvious; but it is worth pointing out that such a system constitutes a danger for other underground mains which might be positive. The necessity of having non-resistant joints would also arise.

5. *Electric Drainage of Mains.*—Drainage consists in fixing such metallic connections as will prevent the current leaving the pipes electrolytically—that is to say, through the ground. It is clear that if this is done the current in the pipes will be increased, that the latter will in fact become an integral part of the electric system. From it there will result differences in potential between the drained pipes and the others; and thus the latter may find themselves in a far worse situation from the point of view of electrolysis. One must therefore aim at the coupling-up and draining of all underground pipes and cables.

On the other hand, by reason of the increase in the intensity of the current, such drainage would constitute a real danger for pipe joints offering a high resistance, which happens to be the case with gas and water pipes. There is also the possible danger due to the inflammability of gas. Finally, it must be borne in mind that there will be an increase of cathodic corrosion in the event of the current being picked up by the pipe where the earth contains alkalis. To sum-up, the employment of this method should not be encouraged, unless it is a case of a choice of evils.

The study of various means of direct protection of underground mains seems to prove that extremely costly methods, of which the efficacy is by no means sure, may be employed, but that it is impossible to make certain. It remains therefore to examine what means may be employed to suppress or at any rate to reduce stray currents.

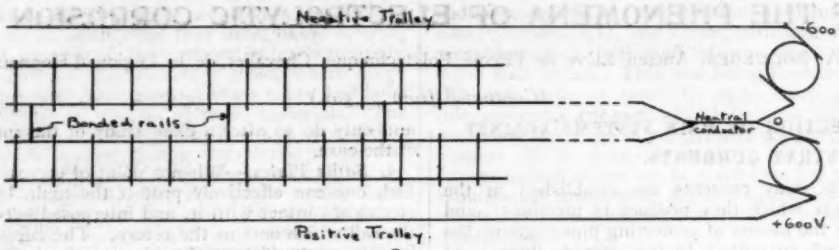
B.—INDIRECT PROTECTION BY SUPPRESSING THE STRAY CURRENTS.

The essential point which has emerged from the research and experiment carried out for several years is that the remedy must be looked for in betterment of the conditions under which electrical systems function. Regulations have been made in each country to define these conditions; but before discussing the subject, we will look more fully into the methods which can be employed to suppress and reduce earth currents, for it is from knowledge gained in this direction that the regulations have been framed.

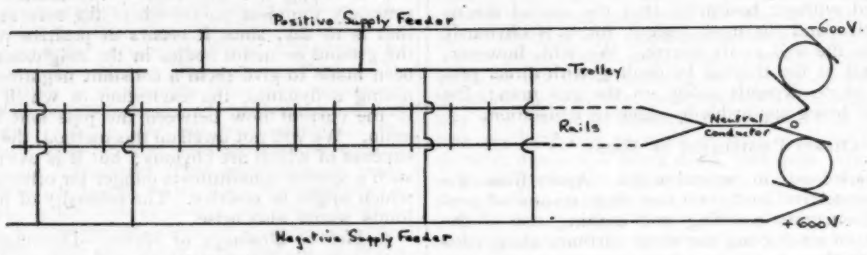
We have already examined the causes of stray currents, and have seen in particular that electric installations other than traction systems do not normally give rise to earth losses. These losses can only exist through accidental causes, and one can but employ material of good quality and repair it in case of mishaps; and we shall see that the regulations which have been framed are directed to this end.

The case of tramways employing rails not insulated from the ground as return leads must be examined in detail. It is clear that if the return line is laid as well insulated as the supply line, the escaping currents will be cut down to those which cross to earth—to the accidental ones mentioned above. That is to say, they would be to all intents and purposes suppressed. But such a radical solution offers numerous difficulties which make it nearly always prohibitive for urban undertakings.

Another solution would be to employ alternating current, which is much less dangerous; but alternating current motors are not so suitable for town traction purposes, the main disadvantage being in connection with the regulation of speed. In any case, one could hardly ask tramway, &c., undertakers to modify the whole of their plant. Another course which has been proposed is to change the respective polarities of the trolley wire and the rail, for, in general, the positive zone being near the generating station, it is less extensive than the negative zone, where the current leaves the rails for the pipes. The current leaving the pipes would be diluted by the polarity being changed



PARALLEL 3-WIRE SYSTEM.



SECTIONIZED 3-WIRE SYSTEM.

Fig. 2.

in the zone previously negative; and as the negative is bigger than the positive zone, the density of the current would be weaker. One sees at once the disadvantages of this process—it increases the number of pipes attacked, and merely postpones the time when serious damage becomes evident.

If the phenomenon of electrolysis were perfectly reversible—that is to say, if by changing the direction of the current the corroded metal regained its nature and became part of the pipe—one could periodically change the polarity of the trolley rail. Such reversibility is far from perfect; and experiments carried out by the Bureau of Standards at Washington have shown that if a current is reversed for twenty-four hours, the corrosion of iron pipes is diminished by three-quarters. In the case of lead pipes, the current must be reversed far more often to reduce the corrosion by only 50 p.ct. Further, the method of change of polarity would constitute real hardship for traction undertakers, and would be in many cases impossible to effect. The three-wire system of distribution, which in certain cases has been applied for other reasons, presents real advantages from the point of view of reducing stray currents. The system is shown in fig. 2. The track rails serving as the neutral conductor, the current in them is theoretically *nil*, since at any moment the load is equally divided between the positive and negative trolley wires. In practice, the voltage drop can nowhere attain a dangerous value.

But it would be very costly, and in many cases prohibitive, to replace ordinary installations by the three-wire system; and besides, the system presents serious disadvantages to the undertakers (a less regular pressure at the terminals of the motors, giving rise to irregular speed and defective lighting, and, in the parallel wire method of application, a high pressure between the two trolley wires, and consequent difficulty of insulation and danger). Summing-up, it may be said that the system is little favoured, and presents only a theoretical interest to the owners of mains.

Let us then examine the means immediately at the disposal of traction-system owners, taking the case of the overhead line being always positive and the current returning to the works along the track rails; these acting as the negative conductor in a two-wire distribution system.

The first thing to realize is the reduction to the minimum of the resistance of the return rail. The current will then have less tendency to escape to earth; the potential difference between the rail, the earth, and underground pipelines is, in effect, diminished. Such a condition is of advantage to the tramways, too, for the transmission loss will be lowered. It is necessary, then, that the rails should be well bonded electrically, and that their resistance should not exceed a certain value. The realization of these conditions must be subjected to verification. A further point is that the two rails themselves must be electrically bonded.

In the majority of cases, the actual resistance of the trackway, although it be well laid, is too high, and the pressure drop becomes excessive if the return circuit is constituted by the rails only. Accordingly, the suggestion has been put forward to employ extra conductors in parallel with the rails.

This method would be costly and somewhat unpractical; but the inspiration brought another idea with it—the employment of insulated feeder lines between certain points of the track and the works. The current being "bled" at several points, its density in the rails is reduced, and consequently also the pressure drop (see fig. 3). Further, the pressure loss in the feeders being independent of that in the rails, one can give it what value one likes in the feeders, and employ the copper to limits only defined by heating-up and considerations of economy. Moreover, in calculating the section of the feeders, to ensure that the voltage drop shall be the same in each of them, one can allocate the currents and arrange them so as to bring to a predetermined value the drop between any two points of the track.

The calculation will be done on the lines indicated in Part II. On the hypothesis there set out, and on the assumption that there is no earth derivation*, the potential difference between two points will be (employing the same notation as before):

$$V_2 - V_1 = r_g L \frac{I_2 - I_1}{2}$$

By following Kirchhoff's rules, we are able to determine the drops in all sections of the track and the return leads; and the latter may be designed so that the fall in each case is within the desired limit. Naturally, the calculation of the section of the feeders and the design of the connections must be carried out with the greatest care.

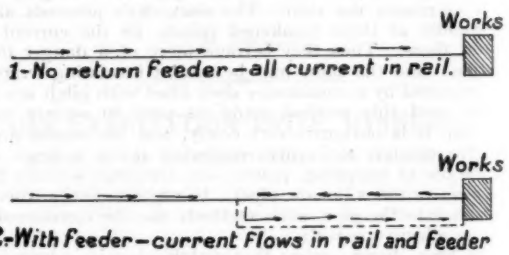


Fig. 3.

It is also highly important, in practice, in order to lessen the dangers of electrolysis, to maintain the return feeders at equal potential, and to design them to give equal pressure drops. This is effected by putting in either variable resistances or boosters.

USE OF STEP-DOWN TRANSFORMERS OR BOOSTERS.

The method consists in employing a negative booster, which is a dynamo driven by electric motor and having its armature in series with the circuit in which it is desired to lower the tension. By arranging that the intensity of the inducing field of the motor varies with the load on the tramway system, one can automatically regulate the pressure drop on the track.

SUB-STATIONS.

When heavy traffic is involved, sub-stations may be established to deal with the various sections.

To sum-up, traction undertakers have at their disposal practical means of reducing stray currents—by diminishing, on the one hand, the electrical resistance of the rails; and, on the

* If the hypothesis does not stand, the calculation will be wrong, for the actual pressure drop will be below that found.

other hand, the current intensity through the medium of appropriate feeders. Indeed, regulations actually in force have been framed to this end, and prescribe conditions of working and the necessary tests.

French Legislation—The Order of April 30, 1924.—We will now examine the French regulations as set forth in the Order of April 30, 1924, prescribing the technical details which must be satisfied by electric energy distribution systems. The Order appeared in the "Journal Officiel" for July 1, 1924. The more interesting passages will be discussed.

The general question of electricity distribution is dealt with in Part I. We have already stated that escapes can only be accidental; and the Order is confined to prescribing, for underground cables, the means of insulation (Part I., chapter 1, articles 8, 9, 10). In section 4, article 12, paragraph 3, is prescribed the earthing of frames and parts not in the circuit; and we have already pointed out that this cannot give rise to stray currents. In Chapter 3, section 1, article 30, it is laid down that electric conductors must be at a minimum distance of 0·20 m. from gas and water mains. Chapter 3, article 36, sets out conditions relating to underground works of the P.T.T.

The most important question—that of traction systems—is dealt with in Part II., section 2—Utilization of Track Rails as Conductors. Articles 61 and 62 contain general prescriptions; and article 62 defines the expression "mean pressure drop and intensity." In the urban zone it will be the average while the service is running, and in the suburban zone the average over the whole 24 hours.

Article 63 deals with the conductivity of the rails. The mean pressure drop per joint must be below 0·005 volt in the urban and 0·010 volt in the suburban zone. Breaks in the track must be bonded electrically; and the average pressure drop at such points must be below 10 millivolts per metre of gap. Finally, the rails must be connected transversely at every 10 joints, and the feeders insulated from the ground.

Article 64 limits the calculated pressure drop in the rails, and thus indirectly the current intensity in the rails, since "the concessionaire must be able to show that the line followed by the return current (rail section, connections, return arteries, &c.) is in accordance with the following prescriptions. The average pressure drop, calculated according to time-table and assuming that there is no earth derivation*, must not exceed 1·1 volts per kilometre of track in the suburban zone."

But this obligation is imposed only upon new lines and upon old ones which undergo modification in the service of trains, construction of the tracks, or in the mains serving these tracks (article 64, paragraph 2).

*In the circumstances it is seen that it is really the intensity that is limited, and not the voltage, as many writers would have it believed.

Article 65 relates to the pressure drop as measured in the rails. This must not exceed on the average 1 volt over any kilometre, taken at random, in the urban and 2 volts in the suburban area. These limits are doubled if no subsoil works are within 4 metres of the conductor. This article is, in fact, the natural sequence to article 64, the prescriptions of which it ensures; but it should be noted that if derivations occur in the earth or in neighbouring pipelines, the intensity of the current in the rails, and consequently the pressure drop, will be lowered, and will facilitate the apparent observance of what article 65 lays down. This point is most important; and we shall examine the consequences later (Part IV.—Steps to be taken by Subsoil Users—Survey).

Article 66 relates to feeders and arteries in circuit with the rails.

Article 67 is very important for us. It deals with the resistance between the rails and subsoil conduits. It lays down that this resistance must be increased wherever the rail potential tends to be negative, and forbids metallic connection between the conduits and the track (paragraph 2). Finally, in paragraphs 3 and 4, the minimum distance between the conduits and the rails is fixed at 0·70 metre. As in the case of town distribution cables, it behoves us to enforce observance of this precaution and to observe it ourselves.

Article 68 is concerned with the undertakers' supervision of their system. Tests of the conductivity of joints and track must be made once a year. Chapter 2 deals with tracks laid on an independent road-bed, and has less interest to us.

It remains to call to mind that in the Explanatory Memorandum which was issued with the Order of April 30, 1924, the Minister of Public Works stressed a most important principle of Common Law. In dealing with Part II., he expressed himself as follows: "It is hardly necessary to point out that strict observance of these prescriptions will not suffice to exonerate undertakers from their responsibility to third-parties to whose works damage may be occasioned either by induction, or by electrolysis, or by any other cause."

Passing from the French to foreign regulations, we find similar conditions laid down. For example, in England a maximum total potential drop of 7 volts is prescribed, and must never be exceeded (the drop is to be taken as the mean between the average over the half-hour of maximum load and the maximum registered during that time). The current density must not exceed 9 amperes per square inch of rail section. With the normal track resistance, this corresponds to a drop of 2 to 3 volts per kilometre at the peak, and 1 to 1·3 volts on the average.

In Germany, the regulations prescribe a total pressure drop at normal load of 2·5 volts maximum between any two points in the urban zone, and 1 volt per kilometre in the suburban zone.

(To be concluded.)

COAL AND BYE-PRODUCT EXPORTS.

The export coal trade appears to be brightening up, notwithstanding the issue of further Royal Orders in Spain, which (in conjunction with the recent decree instituting government control of the Spanish coal industry) provide for regulations governing floating fuel deposits, and the registration of the importation of foreign coal. Foreign coal can in future be received in Spain only after previous notification has been given to the authorities. All stocks of such coal held in the country have also to be stated monthly in sworn declarations. From Aug. 9, foreign coal imported into the country will be inspected and registered, and no coal may now be landed at the ports before the consignee has fulfilled the requirements of the registration office. One feature of the recent coal exports from this country is the increased shipments to South America.

Coal Exports.

Looking at the figures, it is seen that in July 4,176,289 tons of coal were sent abroad, which compares with 7381 tons in July last year, and 4,442,256 tons in July, 1925. The values were: July, 1927, £3,599,610; July, 1926, £7708; July, 1925, £4,465,092. The gas coal shipped in July amounted to 513,630 tons, as compared with 561,225 tons in July, 1925. The values were: July, 1927, £419,410; July, 1925, £517,497. The average value per ton in July this year was 16s. 3·9d.

In the seven months of the year, the total shipment of coal was 30,495,210 tons, as against 18,971,470 tons in the same period of last year, and 30,290,699 tons in that of 1925. It will be noticed that, as compared with 1925, this year has seen an improvement in quantity though not in value. The value for the seven months was £28,397,993, as against £17,236,914 in the corresponding period of 1926, and £31,377,428 in that of 1925. The quantity of gas coal involved in the foregoing figures was, for the seven months of this year, 3,940,392 tons, as compared with 2,491,787 tons in the corresponding period of 1926, and 3,984,020 tons in that of 1925. The values were: 1927, £3,369,548; 1926, £2,032,988; 1925, £2,907,015.

Gas Coke.

This year there has been a little spurt in the demand for gas coke from abroad. In July the amount exported was 74,213 tons; in July, 1926, 11,122 tons; and in July, 1925, 46,695 tons. The values were: July, 1927, £75,093; July, 1926, £11,444; July, 1925, £44,194. The average value per ton in July was £1 0s. 2·8d.

In the seven months, 402,798 tons were shipped, as against 380,440 tons in the same period of 1926, and 271,509 tons in that of 1925. The values were: 1927, £442,866; 1926, £392,477; 1925, £362,660. It will thus be seen that both in quantity and aggregate value gas coke has so far done better this year than in the two preceding ones.

Tar and Tar Products.

Comparatively little business is now being done in benzole, toluole, and naphtha. We will, therefore, only quote the figures relating to tar, oil, creosote, &c. In July, the total export under this heading was 1,314,054 gallons, compared with 4,576,209 gallons in July, 1926. In the seven months, the quantity was 22,929,248 gallons, as against 31,452,152 in 1926.

Sulphate of Ammonia.

The figures for July relating to shipments of sulphate of ammonia show that we have now capped the exports in 1926. In July 23,428 tons were sent abroad, compared with 20,118 tons in July, 1926. In the seven months, the shipments amounted to 136,832 tons, as against 123,201 tons in the corresponding months of 1926. In that period, Spain and the Canaries absorbed 54,780 tons, as against 32,013 tons in the same period of 1926. Another good buyer has been Japan with 39,427 tons, as against 31,724 tons in the same period of 1926. The Dutch East Indies have not favoured us to the same extent as they did last year. In the seven months their purchases have only amounted to 2836 tons, compared with 19,181 tons in 1926.

Gas Oil Imports.

In July, compared with the same month of last year, there was a small reception of gas oil; the quantity being 3,601,362 gallons, as against 13,634,286 gallons in July, 1926. So far this year, however, we have considerably exceeded the importation of last year. In the seven months 62,567,621 gallons have been delivered, as compared with 48,785,672 gallons in the seven months of 1926.

MIDLAND JUNIOR GAS ASSOCIATION.

The revised regulations in connection with the Education Scheme of the Institution of Gas Engineers were considered at a meeting of the Association, in the Birmingham Council House, on Thursday last. Mr. F. C. Briggs, of Dudley (President of the Midland Association of Gas Engineers and Managers), occupied the chair.

The Chairman pointed out that substantial amendments had been made in the scheme; and these would, he thought, go a long way in the direction of meeting the varying circumstances of young men engaged in the gas industry. The matter was to them of great importance. In order that the scheme should be made thoroughly effective and smooth in its working, District Education Committees had been formed. Their business would be to make representations, if such were necessary, to the parent body.

INSTITUTION EDUCATION SCHEME.

By W. L. S. Spinks,

I have been asked to give an account of the Education Scheme of the Institution of Gas Engineers. This is to serve as an introduction to a discussion as to the position under the scheme of students and potential students in the Midlands. Most of you are familiar with the general outlines of the scheme; and I do not propose to deal exhaustively with the different sections, but rather to lay before you the main points which are embodied in the revised regulations that have recently been issued.

Junior Associations and the Scheme.

Speaking for a moment on the attitude of the Junior Associations towards the scheme, I think I am disclosing no secret when I say that we are not in complete agreement with the letter of all the regulations. There are clauses which we hope will be revised as time goes on. But, on the other hand, we are very sincere and wholehearted in our realization of the immense benefits which will accrue to the industry, and to individual members of the industry, from the organized and graduated system of education which we now possess. Very many of us, I feel sure, must look back with regret to study which was more or less wasted, because it was not directed to the proper channels. This waste of time and effort need not now occur. The student can, at the commencement of his studies, embark on a properly systematized course. This course will give him good general instruction in the principles underlying the practice of his industry, and leave him free in the later years to specialize along his particular line, and to make use of the results of such specialization should he decide to sit for his Diploma.

The Gas Education Committee have assured us that the scheme as it stands to-day is not to be regarded as something hidebound and unalterable into which no improvements will be incorporated. On the contrary, it is subject to modification and adjustment as time and experience show that such modifications are necessary to meet students' needs. Existing students, however, may rest assured that their rights will be safeguarded and that no alterations will be made which will prejudice them as to sessions' work that they may have already done.

Time is needed for the full benefits of the system to become apparent; but it is impossible to over-rate the advantages which students will reap from the possession of a definite goal for their endeavours.

Regulations.

A certain murmuring is to be heard to the effect that the regulations governing the scheme are too complicated. The fact is that one cannot have any scheme without regulations. Any complications that may exist in the regulations to-day are caused mainly by a desire on the part of the Gas Education Committee to cater for the exceptions, as well as for the straightforward candidate. We hope that, as the scheme grows up to manhood, these troubles of its callow youth will disappear, and that alternatives and exemptions will be neither desirable nor necessary.

To-day we know that there do exist students who have done much preparatory work outside the scheme; and they very rightly want to be given credit for this, so that they may not retraverse old ground. But many complaints as to the regulations will be found, on analysis, to proceed from a desire on the complainants' part to "jump into" the scheme on the strength of a very fragmentary knowledge of the cognate subjects. In other words, they are students who desire to avoid study. One cannot help thinking that to a very large extent they have missed the whole idea underlying the scheme. If exemptions are carried too far, they tend in effect to penalize those who enter normally into the scheme. Participation in the whole scheme gives assurance of, at least, a working minimum of knowledge in the chemical and engineering principles which are essential to the proper understanding of the practice of the industry. The Institution rightly regard this assurance as being equally as important as ability of the student to answer an examination paper in Gas Engineering or Supply.

Availability of Instruction.

The would-be student whose only complaint is that there are no courses available to him in his area comes into a very different category. For him we must have every sympathy. The ultimate success of the scheme depends on its being universally available to all intending students; and this question of accessibility of instruction is, in my opinion, the outstanding difficulty in the working of the scheme. It is hoped that the revised regulations will meet some of the cases of difficulty under this heading; and I propose referring to these later.

At the same time, we must not exaggerate this difficulty. We must remember that the regulations governing the Major Course under the scheme are, in general outline, very similar to those governing the courses for national certificates in chemistry or mechanical engineering. These national certificate courses have been in existence for some years, and attract a very large number of students.

Outline of Scheme.

As you are no doubt aware, the scheme consists of three separate courses:

1. A five-year major or professional course sub-divided into two portions, the ordinary grade and the higher grade, instruction in which is consecutive.
2. A minor group course consisting of instruction in gasworks practice and gas supply practice and certain cognate subjects.
3. A comprehensive craftsman's course in gasfitting, examinations in the various grades of which are held by the City and Guilds of London Institute.

Major Courses.

It is the regulations governing the Major Grouped Course for the ordinary and higher grade certificates that most of you are interested in. These regulations are simple, and are, as I said before, precisely on all fours with those governing other national certificate courses.

For the ordinary grade certificate, the course extends over three years; and 150 hours' instruction must be given in the classes forming the year's course. At these 150 hours' instruction, the student must make 60 p.ct. attendance—that is, a minimum of 90 hours per annum actual instruction. In this minimum of 90 hours not only has gas engineering and supply to be studied, but also certain cognate subjects, to a standard equal to the third year senior course of an approved technical school.

For the higher grade certificate, two further sessions are required, with more study either in the original ancillary subjects or in alternative ones. It is suggested that if a student has obtained the ordinary grade certificate in a course in which special emphasis is laid upon chemistry, he should devote himself to engineering subjects in the course for the higher grade certificate. To the student at those centres where an approved school exists, this course presents no difficulty. The regulations are reasonable and definite.

It is the student who is not working within a reasonable distance of an approved technical school whose case presents difficulties. Out of fairness to the internal student, the Education Committee must require of the external student a standard in the cognate subjects not less than that demanded from the internal student; and instruction up to the third year senior course of an approved technical school in mathematics, physics, chemistry, &c., is not easily obtainable. Yet before he can sit as an external student for the ordinary grade certificate, the country student must show that he has received instruction up to this standard.

District Education Committees.

Now, this is a point at which the District Education Committee will be useful. Such country students—and, indeed, all students who are confronted with any difficulties—are urged to make application to the District Gas Education Committees which have already been called into being under the revised regulations. A Committee has been set up in each district, to consist of not more than nine nominated members. Our Midlands District Committee comprises four members of the Midland Association of Gas Engineers and Managers, four members of our own Association, and Mr. Hefford nominated by the Board of Education. To this Committee the student must look for a happy issue out of all his afflictions. This District Committee has not supreme power vested in it; but its recommendations will have great weight with the Gas Education Committee which has now replaced the Advisory Board.

One of the aims and objects of this District Committee is to get in touch with, and obtain particulars of, all present and potential students in its area, and to make these students acquainted with those approved courses of study which already exist in its area. It will also obtain from the Board of Education representative particulars as to all existing educational

facilities; and I presume that, where no approved course is being run, it will endeavour to map-out for individual students a special course of study which it can recommend as an acceptable substitute.

There may be some would-be students who do not receive sympathetic treatment from their engineer and manager. Certainly some engineers and managers find it difficult to obtain the sympathy of their board or committee towards educational grants. The District Committee will use all its energy and such influence as it may possess, to secure facilities for suitable students to obtain instruction. There are other activities of the District Committees which I need not dwell upon; but I hope I have said enough to make all students realize that they have now a local body to look after their interests, to which they can appeal, and from which they can expect help to the limit of its powers.

The District Committee is the students' friend. Our Chairman of to-night (Mr. Briggs) is a member of the Midland District Committee. If you have difficulties, let him know of them; and when you do this, please tabulate your facts. A meeting of the Committee will take place during the next few days. Let Mr. Briggs have your facts and troubles—tersely expressed and neatly tabulated—before the meeting.

Diploma Regulations.

Passing on now to those who are hoping to obtain a Diploma, they will find that the revised regulations give them some relaxation in conditions. In the case of those students who are now over 25 years of age, the regulation as to the passing of the Matriculation Examination may be waived by the Gas Education Committee. In fact, this discretion is allowed for any student presenting himself before June 30, 1932.

Candidates will also be able to obtain from the Gas Education Committee an opinion as to the suitability or otherwise of any particular subject which they propose to use as a basis for their thesis. Some doubt seems to exist among Diploma candidates as to this question of the subject for their thesis. I take it, however, that the subject is of minor importance; the vital point being the way in which the subject is treated. I presume that the subject dealt with might be one of more or less routine practice, so long as deductions were made from it which showed original thought. I understand, also, that any intending student who submits the subject of his thesis to the Education Committee will be advised by them as to whether they consider it suitable.

Sub-Divisions of Syllabus.

Students will find that some revision of the syllabuses for the various courses has taken place; and in addition to this each course syllabus has been more carefully set-out under subject headings. A careful study of the syllabus will prove very helpful to students; and the syllabus will be a useful basis for private reading. It is clearly impossible for the best of teachers to cover adequately the whole of the field in either gas engineering or gas supply in twenty or twenty-five class meetings; and the student must rely upon private reading and study. If he takes care to systematize his reading subject by subject, as laid down in the syllabus, concentrating upon those divisions in which he knows he is weak, he will find that he will be prevented from indulging in aimless and discursive reading. Reading without system only wastes time, and may develop into a really bad habit.

Minor Courses.

The next two courses embodied in the scheme are the Minor Courses in Gas-Works Practice and Gas Supply Practice. These are intended for those who, either because of their age or for any other reason, do not desire to qualify for the professional—that is, the five year major—course in either gas engineering or gas supply. In these courses some slight differences have been made between the Gas Supply Practice Course and the Gas-Works Practice Course.

The Course in Gas-Works Practice extends over two years, and requires 60 p.ct. attendance at classes of 100 hours' instruction per year. Two papers are set at the end of the second year: (1) Gas-Works Practice; (2) Science.

The Minor Course in Gas Supply Practice extends over three years, with the same yearly requirements as to attendance. For the supply practice student who takes an approved course there will not be any separate science examination at the completion of his course. A student who has obtained a certificate in gas supply practice may enter upon the third year of the Major Course, and sit for the ordinary grade certificate at the end of the session's study. This establishes for supply students a bridge between the minor and major courses.

Drawing.

One question to which prominence has been given by the Examiners is the quality of the sketches in the papers submitted, and students appear to be uncertain as to what is required. I take it that any drawing submitted should be capable of execution in approximately 20 minutes. This means that strictly outline drawings on squared paper will probably be most appropriate. These should be in rough proportion, and care should be taken that the function of the appliance is obvious from the drawing. From my own experience, I would suggest that such drawings be given plenty of white space round them, and be framed in a neat line frame. All lettering and explanatory legend should be neatly printed; and such printing should be uniform throughout the paper. Anyone can learn a neat type of printing in a few hours; and if full value is to be obtained from the time spent on a drawing, a neat appearance is essential.

Lack of Text-Books.

Another trouble from which students suffer is the lack of reasonably priced text-books. This is peculiarly the case with supply students. I would suggest, however, that even a partial or poor text-book is better than none, if it is used in the proper way. If a text-book is consulted for a definite purpose, and in relation to a definite subject, and the information it contains contrasted or compared with what the student has already gathered from experience or from lectures, then the very shortcomings of the text-book may act as mnemonics. Students will also find that there are on the market several little books at a cheap price which deal with partial aspects of the syllabus and which will be found very convenient. For instance, there are the "People's Books" Series—"Light," "Radiation," and "Organic Chemistry," 1s. each; Pitman's series—"Illuminating Engineering" and "Manufacture of Town Gas," and Gilbert's "Gas Meters."

In conclusion, I would urge younger members not to be discouraged by criticisms of the scheme which they may hear from their older colleagues. If the certificates are to carry the value which we are sure they will, they must be a guarantee that students have put in a reasonable amount of study, and taken a real interest both in their everyday duties and in those subjects which deal with the basic principles on which the practice of the industry is founded. I feel sure that any real student will admit that, in asking for a guarantee of a minimum of 90 hours per session at classes of instruction, the Institution is making a very reasonable demand; and they may rest assured that the Institution is doing all in its power to ensure that such instruction is made available to students.

Discussion.

Mr. W. J. Pickering (Birmingham) expressed the hope that a friendly attitude would be taken with regard to the scheme. The regulations, as revised, were not final; and it should be understood that they would be further revised as necessity arose, as the scheme could not yet be regarded as ideal. The new District Education Committee should be able to help considerably in solving local difficulties and in presenting promptly and fully special cases to the general Committee. Many of the present difficulties experienced in fitting into the scheme men who had already had a fair amount of training in ancillary subjects would disappear as time went on; but there, again, the new District Committees would find useful work. He was afraid that no committee could guarantee every student a happy issue out of all his afflictions, but it would undoubtedly be easier than in the past to arrive at the true details of any particular case, and thus secure proper consideration. Students must not forget that a somewhat higher standard of examination work was expected now than under the old City and Guilds regulations, but still one which the careful student could reach. The real difficulty in regard to examination work was undoubtedly that of putting down one's ideas on paper in the time allowed; and the need for continued practice in that direction could not be too strongly emphasized. For first class one must get at least 70 p.ct. of possible marks in examination in the principal subject—Gas Engineering or Supply. Suppose the student only answered six questions instead of eight. Assuming all questions to carry equal marks, he must secure 94 p.ct. of possible marks for those six questions in order to make certain of his first class certificate. Now this was rather a "tall order." He hoped no student would be discouraged by criticisms of the scheme. For the student at, or near, a centre of instruction, as in Birmingham, who could follow through the whole course, the scheme was a splendid thing. For others not so fortunately situated, the revised scheme sought to help as best it might. For "better or worse" committees and students had to work-out the scheme in practice; and they might all rest assured that needful modifications would be adopted as were found desirable. The scheme must be moulded so as to be of greatest benefit to the industry.

The President said he did not think it was wise that students should pay any attention to the point that the scheme might be subject to further revision. The fact was that they had now a revised scheme, and as such they must regard it. The scheme must be tackled as it existed to-day. It was not given to everyone to go on to the diploma stage; and the higher grade certificate would be of real value—more so, in fact, than the final of the old City and Guilds. He hoped students would not be deterred by the use of the ghastly word "thesis." It had been a great stumbling block, but in reality it simply meant a composition containing original thought. The main object of the District Committees was to ascertain local opinion, and incidentally to relieve the main Committee of a certain amount of responsibility. The Midland Committee, which would meet shortly, and appoint its officers, would endeavour to ascertain fully what were the educational facilities that were available. When they had this information, they would be in a position to advise students who might be in a difficulty as to how best to proceed. If students, or potential students, found difficulty in securing in their district the right kind of instruction, it would be the duty of the local Committee to make an effort with the object of getting the necessary facilities provided. He believed the local education authorities would be found sympathetic in the matter; and it might become necessary

in isolated country districts to take advantage of facilities at some of the secondary schools.

Mr. KEAY (Kettering) stated that in some of the towns far removed from the big centres there was a real difficulty in obtaining tuition for the juniors in gas manufacture and supply. The technical schools did not take those subjects, but only ancillary ones. He would like to know how this difficulty was to be met.

The CHAIRMAN said it appeared to him that, if a student was living in a town (say) 50 miles from an institution at which teaching in gas engineering was given, the main Education Committee would accept a scheme consisting of the ancillary subjects in the local school, with gas engineering taught on the works.

Mr. GREAVES (Shrewsbury) stated that, as a student, he was able, from experience, to confirm this statement. He inquired when the list of subjects for the thesis for the Diploma would be issued.

The CHAIRMAN replied that such a list as had just been referred to would be issued shortly. It was intended to be a guide as to the kind of subject desired.

Mr. C. F. W. RENDLE (Redditch) said it appeared to him that the publication of a list of subjects for a thesis might tend to restrict the choice. The value of the composition really lay in its originality; and he thought any tangible composition on some subject of interest to any branch of gas engineering or gas supply would be treated with proper respect. As to the examination papers, it was of importance that there should be no ambiguity about the questions. In the past they had sometimes left room for doubt, which was unfair to the person under examination. The value of a sketch lay in showing what was meant to be shown, with, of course, no vital omission. But it need not, in his opinion, be an elaborate piece of drawing.

BABCOCK & WILCOX WATER-TUBE BOILER MAKING.

Imparting Information by Film.

Judging by previous displays of the series, there are likely to be many interesting things to be seen at the Shipping, Engineering, and Machinery Exhibition which opens to-morrow (Sept. 8) at Olympia, and will remain open until the 24th. There are to be various organized visits—one of them, on Sept. 12, by the Institution of Gas Engineers. Among other things which they and other readers of the "JOURNAL" who journey to Olympia will doubtless make a point of seeing is a film which Messrs. Babcock & Wilcox, of Farringdon Street, London (whose main works are at Renfrew, Scotland), will be showing four times daily—at 11.30 a.m., 2.30 p.m., 4.30 p.m., and 7.15 p.m.—on their stand in Row D., No. 4.

Having been present at a Press view of the film, we can venture to say that those who make a point of seeing it will not regret having done so. It is highly informative from start to finish; and the skill and effort devoted to its production are worthy of all praise. During the three-quarters of an hour or so which the film takes to display, interest does not for one moment flag. It makes clear, as no other method could do in a period many times as long, the principles of design of the Babcock & Wilcox water-tube boiler, its action under operating conditions, and details of its general construction and manufacture.

PRINCIPLES OF DESIGN.

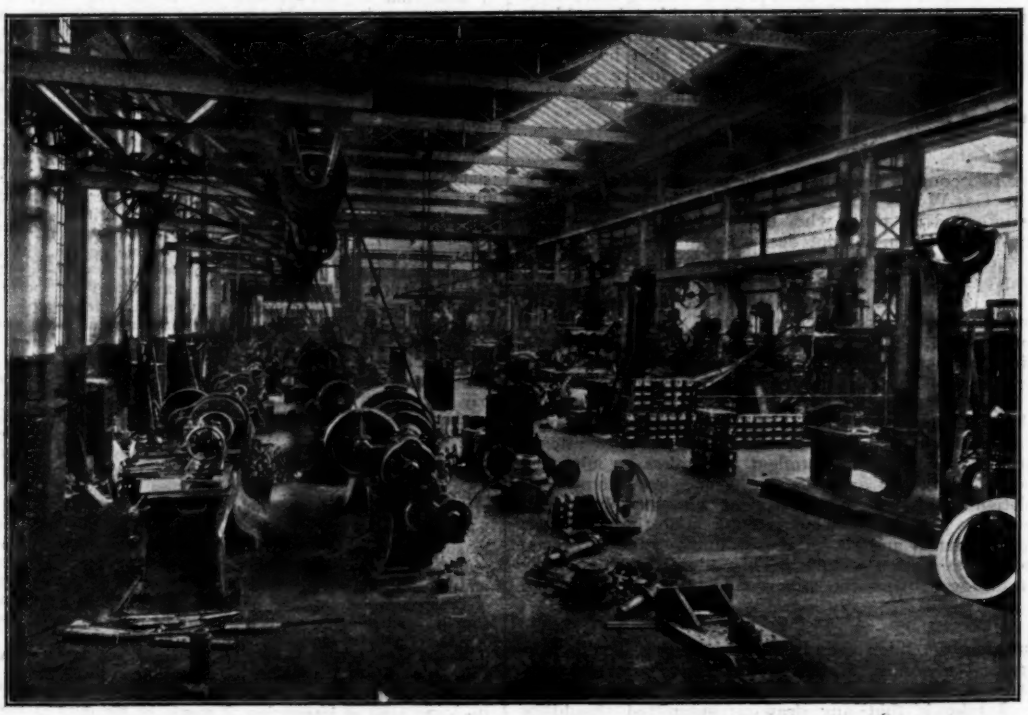
In the first place, there is very appropriately a detailed explanation of the principles adopted for efficiently transmitting the heat units liberated in the furnace to the water in the boiler. This is accomplished by a specially prepared cross-section of a typical Babcock & Wilcox boiler unit. A moving pointer first calls attention to the more important parts of which the boiler is built-up—such as the staggered headers, the solid-drawn straight steel tubes, the method of suspension, the superheater details, air supply, furnace space, and other essentials. The system of baffling adopted is made clear; and the path of the air, furnace gases, water, and steam traced. The path of the air through the fans, air heater, furnace boiler, superheater, and economizer is then ingeniously demonstrated as in actual operation. The flow of the feed water is next traced from the time it enters the boiler drum until it leaves the superheater outlet in the form of steam; and following this explanation, views of the water circulation as it would actually appear under working conditions are depicted. The Babcock & Wilcox mechanical chain grate stoker is next introduced; and after attention has been called to the salient features, the grate is shown in operation—the furnace flames rising from the fuel bed, and passing completely through the unit, so as to indicate clearly the system of baffling and the course which the furnace gases actually follow in a working boiler.

To conclude this section of the film, the various items enumerated above are combined to form a complete picture, so that there is a realistic indication of a moving grate, the burning coal, the ebullition of steam in the boiler tubes and drum, and the passage of air into the furnace; the whole giving a graphic idea of the conditions prevailing in a Babcock & Wilcox boiler while actually under steam.

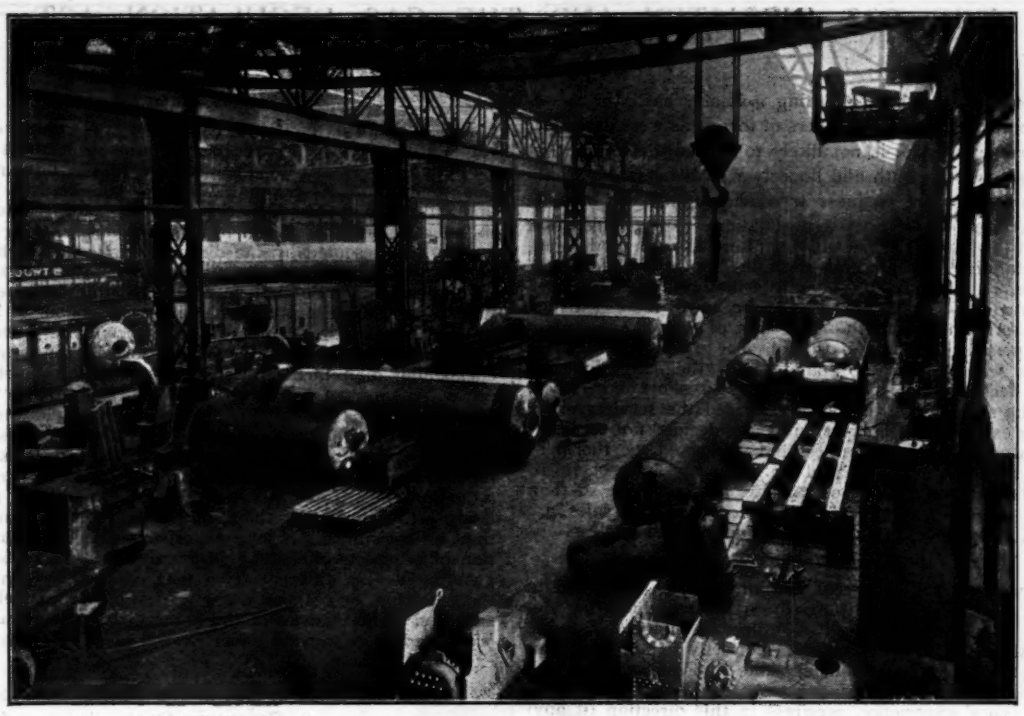
DETAILS OF CONSTRUCTION.

The second section opens with a view of the drum shops, showing a steel plate proceeding to the rolling mills, through which it is passed in a single length. The bending process is rapidly accomplished; and one sees the shell being withdrawn in the form of a perfect cylinder. This is then transported to the multiple-spindle drilling machines, after which the necessary buttstrap is placed in position, and the whole carried to the hydraulic riveters, which rapidly complete their part of the work.

The preparation of the boiler drum-ends is then illustrated



THE MACHINE SHOP.



THE BOILER SHOP—MAIN BAY.

from the time the plate is taken from the heating furnace by means of special slings to the hydraulic press, until it is turned-out complete in every detail, with manhole and gauge-fitting depressions, in a single pressing which occupies only a few seconds. The complete drum-end, after removal from the press, is shown on the turning machines being prepared to fit into the shell, the ends of which are also machined in order to ensure a perfect fit.

Details of the drum nozzles for the reception of safety valves and other connections then form an interesting series of pictures. The nozzles are forged from solid billets; and the breaking of one of these is seen. The broken billet is carried to the furnace, from which it is transported white hot to the steam hammers, and subsequently to the hydraulic press, where, in a single operation, the outer shape is completely formed by means of a clever arrangement of split dies illustrated in the picture. The nozzle is then bored, and later machined in a special lathe capable of performing six operations at one time, and finally fitted into position on the boiler shell, marked-off, and riveted in place again by the hydraulic riveter. The complete drum, after careful inspection, is transported by overhead travelling cranes to the despatch department ready for shipment.

There is a particularly interesting example of the forging and flanging of superheater boxes, followed by the preparation and bending of the steam pipes used in connection with the superheaters. Particular attention is given to the preparation of the famous staggered boiler headers which are such an essential feature of the Babcock & Wilcox boiler. These headers are now of solid-drawn steel construction, and the film shows the drilling of the headers by multiple-spindle drilling machines, and the careful inspection and cleaning of the headers after they leave the machine. The boiler illustrated is fitted with internal oval caps, as is the standard practice of the Company for all pressures of over 200 lbs. per sq. in.; and the milling machines utilized in the preparation of these oval caps are seen at work.

The next process is the building-up of complete boiler tube sections; and the whole operation of inserting the boiler tubes in the back and front headers after the tube-ends have been thoroughly cleaned is illustrated. Tube-ends are rapidly placed in position by the operators; and the mechanical expanding tools driven from motors by flexible shafting are seen at work. All tube expansions having been completed, the handhole caps are fitted and bolted-up, and left ready for testing by hydraulic pressure. In this operation every facility is provided for rapid and efficient inspection of the tube section while actually under pressure; the test gauge indicating a pressure of something over 600 lbs. per sq. in. Finally, the whole section being approved as water-tight is disconnected from the pressure supply, the water is run out into a tank beneath, and the complete section carried away by overhead cranes to the boiler shops for erection. This section of the film affords an excellent example of the rapidity with which a complete boiler tube section can be completed under modern conditions.

The Shops.

In the final section of the film there is an excellent general view of the shops devoted to the preparation of the steel casing. This casing is standard equipment for the "C.T.M." boilers with which the majority of the power houses and large steam raising installations are now equipped. Following this, a visit is paid to the erecting shops, where many interesting processes can be seen. Boilers are illustrated in process of erection; framing and tube sections being rapidly lifted into place by the overhead cranes ready for the reception of the boiler drums. The particular skill with which the centring of the drums on to the header connections is arranged for is a noticeable feature of this picture; and the whole gives an excellent example of the actual shop erection of a boiler plant before despatch. In other views there is shown the actual erection of a large size Babcock boiler *in situ* at a power house; the boiler being seen when about three-parts completed, while all sections, from the furnace to the superposed economizer, receive attention.

The film fittingly concludes with a reproduction of the outer cover of Messrs. Babcock & Wilcox's publication "Steam," followed by a glimpse of Hero's engine, from which the firm's trade mark was originally designed.

MIDLAND BUILDING AND ALLIED TRADES EXHIBITION.

Bingley Hall, Birmingham, Sept. 5 to 17.

There was opened at Bingley Hall, Birmingham, on Monday last, the second Midland Building and Allied Trades Exhibition, organized by the Birmingham Chamber of Commerce (Inc.). The President is the Lord Mayor of Birmingham (Alderman A. H. James, C.B.E., J.P.); and the exhibition, taking into account the progress made in many special branches, necessarily covers a much wider field than its forerunner.

Pending fuller notice of the exhibits of special interest to "JOURNAL" readers, it may be mentioned that, wherever practicable, recent progress is demonstrated by means of working machinery, so that the building expert may witness the process from the beginning. The newest methods of heating, lighting, and ventilation are also shown in operation. The regulation of temperature in the broadest sense, from the production of heat for culinary purposes to the preservation of even atmosphere throughout the home or the factory, forms one of the most important sections in the exhibition. In another section advanced methods of road breaking and road making are shown, including rapid-hardening cement, concrete mixers, and the newest ideas in reinforcement.

Special displays are made by the City of Birmingham Gas and Electricity Supply Departments.

Conferences on various subjects have been arranged.

THE GAS INDUSTRY AND THE GAS REGULATION ACT.

By NORTON H. HUMPHRYS.

That new arrangements affording a clearer basis for agreements as between buyers and sellers of town gas were desirable, if not overdue, in 1920, is not likely to be denied, seeing that a mutual respect for truth and honesty will always be a necessary feature in sound business transactions, modern notions notwithstanding. Gloomy prognostications to the effect that the advent of the therm would be attended with confusion, misunderstanding, accountancy troubles, &c., have failed to materialize. A few exceptions might be noticed, but in a general way the consumers of gas are now more satisfied with the therm than with the cubic foot of former days. Not the least pleasing feature is the absence of proceedings for default, or wilful failure to comply with the obligations relating to declared calorific value. After a short experience, some of the smaller districts have regarded the services of an official gas examiner as a superfluity, and decided not to renew the appointment. The consumers have accepted the therm as a matter of course, and ceased to take any interest in it. Perhaps it is a mystery to the majority, but not more so than the cubic foot. So far as the consumers and the sales are concerned, the 1920 Act has proved an unqualified success.

LIBERTY IN REGARD TO CALORIFIC VALUE.

The benefits of the Act were not intended to be limited to the rental office, but also extended to the manufacturing department. The liberty allowed in respect of choice of calorific values, hitherto practically confined indirectly to not less than 500 B.Th.U., was expected to expedite and smooth the way towards new manufacturing processes and cheaper therms. After five years' experience, progress in this direction (if any) may be regarded as only trifling in character. About 600 gas undertakings have secured orders under the 1920 Act, but not more than 10 p.ct. of the total have cared to deviate far from the safe and old-established rule represented by 14-candle gas. Some 90 p.ct. of the Orders now in existence are confined to calorific values within the limits of 450 to 500 B.Th.U. The number below 450 is about 50, and those exceeding 500 not more than two dozen. The only important effect noticeable is that the continually extending use of vertical retorts accompanied by the injection of steam has tended towards a modest reduction of declared calorific values as compared with those, known unofficially, of the gas supplied under the illuminating power test.

COMPANIES AND CORPORATIONS.

These are the leading conclusions suggested by an examination of the Board of Trade returns for the years 1919 and 1925 respectively, specially directed to undertakings other than those belonging to and operated by local authorities. Not more than two-thirds of the statutory gas undertakings are at present working under the 1920 Act, and as individuals the exceptions are about equally divided between corporations and companies. But so far as the latter are concerned, the defaulters are for the most part of small magnitude, and not less than 90 p.ct. of the entire sales of gas represented by private enterprise come under the new regulations. As much cannot be said of the local authorities, as several important individuals are retaining the former system and selling gas by the 1000 c.ft. Conclusions concerning the working of the 1920 Act may be drawn from the figures relating to private enterprise, to a wider extent than is afforded by the local authorities.

Some of the advantages offered by the Act are better appreciated by private than by public ownership, so inducement for accepting it is not so powerful to the council as to the company. Apart from this, public enterprise is always slower and more unwieldy than private in matters relating to progress and development; and this fact is only one illustration of a state of affairs that has been observed in many other directions.

EXPERIENCE OVER TEN YEARS.

The consumption of gas was influenced by war clouds in 1919, particularly in the items of public, outside, and ornamental lighting; and six undertakings omitted to send in returns. But the general experience of gas undertakings during the last ten years proves that sweeping regulations for reduction of calorific value or supply pressure have a very small effect in practice. In many examples of the use of gas, a reduction in quality tends to increase the quantity used rather than otherwise; and lower supply pressures at the outlet of the works governors can only apply equally in a small and perfectly level district. In ordinary cases the consumers in the low-level districts would be restricted to an extent much greater than would be experienced at high altitudes. To take one instance, the entire make of gas by all classes of owners during the year 1921, notwithstanding the four months' coal stoppage, was only about 2 p.ct. less than the average for the years 1920 and 1922. During the crucial year, it was 249 thousand millions, expressed in a unit of 1000 c.ft.; and the average for the other two years was 254½—only 5½ more.

UNION IS STRENGTH.

The Act affords increased facilities for obtaining or extending statutory powers, and has stimulated progress in amalgamation, as shown by the decrease in the total number of gas undertakings. Some have been subjected to strenuous and unjust competition on the part of opposing interests, but in no case has there been liquidation and winding up. The business represented by the disappearing concerns has simply passed to the hands of their successors. But, as a rule, the amalgamations take the form of expanding an already large district by the absorption of smaller neighbours. There are but few examples of a number of approximately similar sized undertakings combining for the purpose of concentrating and cheapening manufacture, securing better selling methods, and other benefits, of which it may be said that "union is strength." Action in this direction is handicapped by the dog-in-the-manger policy adopted by local authorities, who fail to realize the fact that no private undertaking is likely to incur responsibilities which for a time would hinder all-round reductions in price of gas, and certainly would not rush recklessly into extensions which might prove a hindrance rather than an assistance. A long experience enables accurate valuation of prospects offered by proposed new extensions; and the position is very different from that adopted by controllers of the municipal or national purse in dealing with novel unproved schemes. The chances of the home district being in any way prejudiced by expansion under control of private enterprise are extremely remote.

ANNUAL MAKE OF GAS IN THE UNITED KINGDOM: COMPANIES ONLY.

The following figures are of the quantity of coal gas, water gas, and "other" gas over several years; those preceding 1919 being included for the purpose of showing the even character and reliability for comparisons.

Year.	Coal Gas.	Water Gas.	Other Gas.	Bulk.	Total.
1908	103,429	16,556	..	..	119,985
1909	104,585	18,346	..	..	122,931
1910	107,590	18,240	..	..	125,830
1911	112,126	18,436	..	..	130,562
1912	115,893	21,115	..	..	137,008
1913	118,952	18,392	4908	..	142,252
1914	116,627	23,768	5453	..	145,848
1919	127,616	28,723	4487	463	161,289
1925	138,035	39,625	4297	..	181,957

The 1925 return refers to England and Wales only; but the Scottish and Irish companies included in previous returns are comparatively small in amount.

Gas bought in bulk appears for the first time in 1919; and is included in the totals for 1925. In order to avoid an unwieldy lot of figures, the above are taken in terms of the nearest million c.ft.

The total increase in 1914 as compared with 1908 is 25,863; and that for 1925 as compared with 1919 is 20,668. The coal gas constituted 79·7 p.ct. of the total in 1919; and 75·8 p.ct. in 1925. A remarkable figure is the decrease in the use of "other gases," which in 1914 reached 3·8 p.ct. of the total. They show a decrease in 1919, and a further slight falling in 1925. In that year they amounted to 2·4 p.ct. of the total.

COAL GAS AND WATER GAS.

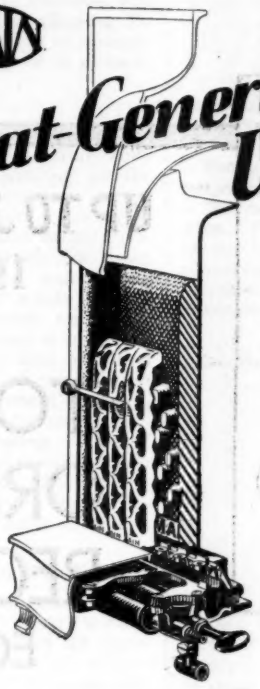
The quantities described as "coal gas" may be taken as representing retort gas, which has become rather a different thing, owing to the extended use of steaming. The make of gas "per ton of coal" is obviously very different from the yield secured from "one ton of coal *plus* one or perhaps two cwt. of steam." The reports of the Fuel Research Board show that the first may be 12,000 to 13,000 c.ft., but that one ton of coal *plus* 2 cwt. of steam will add about 7000 c.ft.; making a total of nearly 20,000 c.ft. The figures for the years preceding 1914 may be regarded as representing "straight" coal gas; but subsequently the use of steam in connection with vertical retorts has been steadily advancing, and attained dimensions in 1925 that are by no means inconsiderable.

The returns for water gas probably include cupola gas as produced by a separate process, and not the water gas manufactured in the coal gas retorts; and the proportion of water gas manufactured in 1925 would be more than is shown under that heading. The coal gas would be less to a similar extent. The 1920 Act has encouraged the production of water gas to an extent greater than is shown by the returns.

The tonnage of coal carbonized in 1919 was near to 10½ millions. A trifle more was used in 1925; but the average make per ton advanced from 12,034 c.ft. in 1919 to 13,177 in 1925. That the gain of 1143 c.ft. was entirely due to improvements in carbonizing procedure, representing a direct gain from

MAIN

Heat-Generating Unit



An Important Point in Maintenance

You can remove the Burner from any Main Gas-Fire *without* having to disturb the Radiants or the Radiant carrier.

The Main Heat Generating Unit, comprising the Brick, Radiants, Burner, and Injector, is all built up and located accurately on the one plate. Its construction is simplicity itself: one screw secures the burner, which is supported rigidly by a three-point fixing, and the nozzles locate in their respective holes in the fuel-plate, thus ensuring that each flame is in correct alignment with its radiant.

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GAS-FIRES

R. & A. MAIN, Ltd., LONDON AND FALKIRK

London Office and Showrooms, 48, Grosvenor Gardens, S.W. 1.
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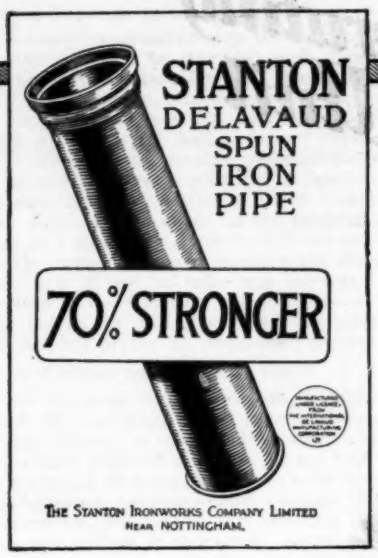


UP TO JUNE 30TH 1927

TOTAL ORDERS RECEIVED EQUAL

2,512 MILES

FROM 759 CUSTOMERS

OF THE ABOVE

REPEAT ORDERS

EQUAL

1,970 MILES

THE STANTON IRONWORKS COMPANY, LIMITED
NEAR NOTTINGHAM.

Telephone: ILKESTON 86. Telegrams: "STANTON, ALFRETON."

the coal, is too good to be true. These figures refer to England and Wales only.

The steady advance in production of gas over the last twenty years suggests the existence of a kind of natural growth, which, like all other commercial development, can be encouraged by enterprise and modern selling methods, and is therefore under control to some extent. After allowing for differences as between one year and the next, due to climatic and other special causes, the even rate of progress is remarkable.

Purchase of Gas in Bulk.

Much attention has been given during recent years to the question of taking a supply of ready-made gas from coke ovens at a distance, in preference to manufacturing on the premises in the usual way. There is something very incongruous about a statutory gas undertaking, subject to stringent obligations relating to calorific value, purity, and supply pressure, being dependent on an outside party entirely free from similar restrictions. Those who take-over the manufacture should also accept as part of the bargain the whole of such obligations—lock, stock, and barrel. The necessity for retaining in full going order a full-size stand-by plant is a serious handicap, and an immediate or quick putting into operation would mean a large initial expense. A gang of retort house hands is not able to get together at a moment's notice. No wonder that the use of coke oven gas by statutory undertakings is a small matter not greatly exceeding "other" gases. The returns for 1925 show 4798 for coke oven and 4297 for "other" gas, respectively 2·63 and 2·36 p.ct. of the total—not more than 5 p.ct. taken together. These figures deserve the attention of those who favour manufacturing units or centres on a scale hitherto unprecedented.

Average Sale of Gas per Meter in England and Wales.

An average is limited to the consumption per meter, sometimes called the consumption "per consumer," though a more conclusive factor would be consumption per head of the population in the district concerned. But the number of inhabitants is subject to continual change, the area of census districts is not coincident with that of gas supply districts, and where substantial quantities of gas are used for industrial purposes there is no relationship with the number of employees or inhabitants. Possibly the best criterion of the status on town gas, so far as it is shown by the consumption per head of the population, could be obtained in a purely residential district not subject to periodical changes in the "floating" class of population.

Million C Ft. of Gas Consumed.

—	Ordinary.	Slot.	Public Lighting.	Sold in Bulk.	Total.
1925	102,577	62,133	4472	..	169,182
1919	90,830	49,646	2638	563	143,677

The consumption by ordinary meters has advanced nearly 12 millions, or about 13 p.ct. The increase shown by the slots is rather greater in quantity, but equivalent to no less than 25 p.ct. No doubt it has been assisted by the erection of large numbers of buildings under Government housing schemes, which are invariably fitted for gas unless the way is blocked by competing interests unable to obtain business by fair competition.

The number of consumers was as follows:

1925 . . . 2,064,811 ordinary; 2,861,145 slot; 4,925,956 total.
1919 . . . 1,776,383 ,, 2,626,765 ,, 4,403,148 ,,

showing an increase in the six years of 288,428 ordinary and 234,380 prepayment—more than half-a-million in all. The average consumption per consumer was:

1925 . . . . . Ordinary, 49,700 c.ft.; slot, 21,800 c.ft.
1919 . . . . . ,, 51,100 ,, ,, 18,900 ,,

The increase on the slots shows an appreciation of the special advantages of gas for all purposes in a small household; and as this class of business is for the most part supplied, by the gas undertakings, with the most efficient and economical appliances, it forms a valuable advertisement of the use of gas under favourable conditions, which is much needed in localities where large quantities of old-fashioned, wasteful, and inefficient burners and fittings are retained in use.

Price of the Therm.

Of course, there are no official records of the therms manufactured or sold in 1919; and those for 1925 are not complete. But a singular feature is that the price does not seem to be greatly affected by the declared value. No particular standard is evident as being superior to others, nor does any one value appear to be cheaper than another. The standard or maximum price is not the same thing as the actual selling price at the moment, but constitutes a lead towards it, because any endeavour to obtain a high value is sure to be strongly opposed, or revised, by the Board of Trade. The following are a few figures taken at random, with preference to medium, rather than extreme, data. Extreme data are to be found in both directions, and are due to exceptional local conditions.

		s.	d.
Declared value . . .	200 B.Th.U. ..	Price, 1	3·8
,, ,, . . .	320 ,, ..	,, 1	10·8
,, ,, . . .	400 ,, ..	,, 1	8·0
,, ,, . . .	425 ,, ..	,, 1	5·0
,, ,, . . .	450 ,, ..	,, 1	4·1
,, ,, . . .	500 ,, ..	,, 1	4·4
,, ,, . . .	530 ,, ..	,, 1	5·6
,, ,, . . .	540 ,, ..	,, 1	3·4
,, ,, . . .	550 ,, ..	,, 1	1·0
,, ,, . . .	600 ,, ..	,, 1	4·5

The agreement between values above 425 B.Th.U. is as remarkable as the fluctuations below that figure.

The actual selling prices on Dec. 31, 1925, follow similar lines. The following, like the foregoing, represent the averages of not less than a dozen undertakings, all other than those belonging to local authorities, where as much information is available; and with one or two exceptions they are limited to undertakings making not less than 100 million c.ft. per annum.

		s.	d.	
Calorific value .	280 B.Th.U. ..	Selling price, 1	6	2 per therm.
,, ,, .	400 ,, ..	,, ,, 1	0·3	,, ,,
,, ,, .	425 ,, ..	,, ,, 1	0·4	,, ,,
,, ,, .	450 ,, ..	,, ,, 0	10 2	,, ,,
,, ,, .	475 ,, ..	,, ,, 0	11·0	,, ,,
,, ,, .	500 ,, ..	,, ,, 0	10·9	,, ,,
,, ,, .	525 ,, ..	,, ,, 0	11·2	,, ,,
,, ,, .	540 ,, ..	,, ,, 0	8·3	,, ,,
,, ,, .	550 ,, ..	,, ,, 1	0·0	,, ,,
,, ,, .	560 ,, ..	,, ,, 0	8·7	,, ,,

Addenda.

Since the foregoing notes were written, the Board of Trade Return for 1926 (Part I.) has been published, and, as usual, received extended notice in these columns (Aug. 10, p. 400, *et seq.*). After some consideration as to the desirability of holding them until the Return for 1926 was available, it was decided that for several reasons the latest figures must be regarded as exceptional in character, and that more conclusive results would be obtained by dealing with 1919 and 1925. But the review of the leading features for 1926 supports the general conclusions, while at the same time affording additional information. Several items are not affected, and retain a normal character.

Of the 13 new declarations of calorific value published during 1926, only two are outside the limits of 450-500. The exceptions are 420 and 425, two are 450, three are 475, one is 480, and the remainder are 500. There are also 10 alterations, of which five are advances and five reductions. The general adherence to established precedent is maintained.

Consumption of Gas and Effect of Restrictions.

During the greater part of the year, Coal Emergency Directions governing the use of coal, production and supply of gas, and limitations on consumption, were in force, and were set forth in clauses 27 to 36. The consumption of coal was to be reduced to the lowest possible limits; supply pressures were to be cut down except at times "when an effective supply of gas to the consumers was most needed;" sky signs, illuminated facias, advertisement or display lights were to be discontinued, and public lighting was to be limited to the "minimum necessary for public safety;" and use of gas for power was restricted to the weekly average during the last complete quarter, subject to the qualification that the percentage might be increased by permit from a local authority, if deemed to be "expedient in the public interest."

Such stringent regulations might be expected to exercise a marked effect on the statistics relating to consumption of gas, also on the unaccounted-for. But the following extracts show (if one may use the expression) an extraordinary indifference.

All Undertakings in Great Britain. (Millions C.Ft.)

—	Total Made.	Sold, Prepayment.	Sold, Ordinary.	Public Light.	Total.	Unaccounted.
1926 .	296,082	39,301	168,105	9163	276,569	19,513
1925 .	283,818	92,747	163,059	9951	265,757	18,061

The increase in the total quantity sold is 10,812, equivalent to 4·07 p.ct.—a larger proportion than was shown in 1924-5, but in close agreement with the average over the last six years, which was 3·96. The number of consumers advanced to the extent of 2·49 p.ct., but the average consumption increased 2 p.ct. The increasing number of slot users must tend to reduce the average over the whole. About two-thirds of the total increase (6514) was due to prepayment meters. The trifling reduction on public lighting shows that the normal consumption is very little more than the requirements of "public necessity."

The unaccounted-for gas shows an increase from 18,061 to 19,513, from which it appears that the hours when "an effec-

tive supply of gas is most necessary" constitute a large proportion of the 24. Neither the total consumption nor the unaccounted-for were caused to vary far from the expectation in ordinary circumstances; and the effect of restriction was less in 1926 than during shorter and less acute trouble in 1921.

But would the figures have been the same in the absence of restriction or suspension of the quality clauses? In previous years, comparisons are on the basis of practically even qualities of coal; but in 1926, large quantities that would not be accepted if circumstances admitted any choice, were used. The make per ton of coal carbonized, and the fact that whereas the make of water gas increased some 35 p.ct., the consumption of oil advanced from 61,382,649 to 97,703,394 gallons, or close on 60 p.ct., suggests that there was no extensive "stretching" of quality, or taking advantage of the official absence of the gas examiner; but the average B.Th.U. would be sufficiently below the standards to have a marked effect on the consumption. If comparisons could also be made in terms of therms, the results would differ from those shown in c.ft.

The advance of water gas from 48,173 in 1925 to 65,310 in 1926 is remarkable, in absence of any reason for supposing that large additions were made to this type of plant during the few months preceding April, 1926. Evidently the cupola is regarded more as an emergency stand-by than as a feature of every-day working, and under usual conditions is not operated to an extent approaching anything like full time; and as much is shown on inspection of both maximum and average stated in the special returns for water gas. In two cases the maximum was the full 100 p.ct., and in many others it exceeded 70 p.ct. Sometimes this may have applied to a few days only, under extremities; but in general it was spread over a longer period, and the averages for the year, which included January to April, frequently exceeded 50 p.ct., and the highest is 69·9 p.ct., illustrating the important part taken by the cupola towards saving the situation. There is no recorded increase in the number of casualties attributable to gas, as compared with those in former years—showing that the carbon monoxide bogey is nothing more substantial than a scooped turnip, and that restriction in that respect, which undoubtedly have tended to obstruct introduction of cupola processes, is unnecessary and uncalled-for.

The following shows the materials used and gas made, in England and Wales only.

—	Coal.	Coke.	Coal Gas.	Water Gas.
	Tons.	Tons.		
1926 . . .	14,972,314	1,401,232	204,492	63,685
1925 . . .	15,483,446	1,119,452	210,157	46,646

The make of coal gas per ton has increased from 13,177 c.ft. in 1925, to 13,719 in 1926, which emphasizes the need for qualification respecting the makes of coal and water gas. The results may be in some part due to increased steaming. The make of water gas has advanced from 41,700 to 45,400 c.ft. per ton of coke.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

New Field Station in Fuel and Gas Engineering.

Through Mr. C. L. Edgar, President, and Mr. R. E. Dillon, Superintendent of the Generating Department, of the Edison Electric Illuminating Company, of Boston, arrangements have been completed whereby the students of the course in Fuel and Gas Engineering of the Massachusetts Institute of Technology will do field work and testing at the Edgar Station of the Edison Company.

This course is intended to train graduate engineers in the theory and practice of fuel utilization, gas manufacture, and power generation. The work consists of one academic year of graduate study at the Institute, followed by six months' field work. In this field work the theoretical side of fuel and gas engineering studied at the Institute is applied to the actual processes of combustion, gas manufacture, and power generation, and oil refining by plant studies and tests on full-scale equipment in commercial operation—all carried out under the immediate supervision of a member of the Institute faculty.

The Edgar Station of the Edison Electric Illuminating Company of Boston is one of the newest and most modern of electric central stations. Its equipment was selected to produce extremely economical operation, and includes many of the latest developments in the power generation field. It contains prime movers operating at both 1200 and 350 lbs. steam pressure, and is equipped with a very advanced type of combustion control. These factors alone evidence the remarkable opportunity which the fuel and gas engineering students of the Massachusetts Institute of Technology are afforded in observing, through study and test work, the detailed working of this central station.

Other field stations of this course are located at the plants of the Cambridge Gas Light Company, the Lackawanna plant of the Bethlehem Steel Company, the Iroquois Gas Company, and the Bayonne refinery of the Tide Water Oil Company.

Refractory Materials Section of the Ceramic Society.—The eighteenth meeting of the Refractory Materials Section of the Ceramic Society has been arranged to take place in the Town Hall, Bournemouth, on Monday and Tuesday, Sept. 26 and 27, under the Chairmanship of Mr. H. J. C. Johnston, President of the Society. A number of papers are down for reading and discussion; and there will be an official luncheon on Tuesday.

"Domestic Engineering, Heat, and Ventilation."—The Directors of the West Central Press, Ltd., proprietors of the foregoing publication, have decided to place the management of "Domestic Engineering" in the hands of Messrs. Lake & Bell, Ltd., 5, Baldwin's Gardens, Holborn, E.C. 1. (Tel., Holborn 1352-3), to whom all future communications should be made.

First-Aid Boxes or Cupboards.—The Chief Inspector of Factories gives notice that, by Order dated June 27, the Secretary of State has prescribed that, as from Oct. 1, 1927, all materials for dressings contained in the first-aid boxes or cupboards which are required to be provided in pursuance of Section 29 (1) of the Workmen's Compensation Act, 1923, or Regulation 4 (a) of the Docks Regulations, 1925, or Regulation 47 of the Building Regulations, 1926, shall be those designated in, and of a grade or quality not lower than the standards prescribed by, the British Pharmaceutical Codex, 1923.

Tetraline for Benzole Scrubbing.

At the Annual French Gas Congress, M. Sellié pointed out that the absorbing power of tetraline for benzole is greater than that of heavy oil (5·6 for the former, 3·6 for the latter), and consequently less tetraline is needed for the recovery of a given quantity of spirit. He briefly described his plant, which consists of a column in which the gas is washed by a solution of tetraline, and a tray evaporator for the after treatment of the latter. The benzole recovered is absolutely clear and of excellent colour. The installation has not been running long enough for costs to be given; but there is an objection in the fact that France has to import her tetraline from Germany, at a very high price. The same disadvantage may be cited as regards activated carbon; so that heavy oil may remain the chief vehicle for benzole recovery.

Equilibrium Combustion of a Mixture of Carbon Monoxide and Hydrogen.

In a paper prepared for the Division of Gas and Fuel Chemistry of the American Chemical Society, Mr. Clarke C. Minter states that when a mixture of CO and H_2 is burnt at high temperatures the water gas equilibrium becomes operative, and the order of the reactions cannot be determined. The burning of a mixture of CO and H_2 in flues is a good example, and Bureau of Mines data show that the conclusions of another writer are not justified—namely, that H_2 burns about three times as fast as CO under such conditions. An experimental study of the combustion of CO and H_2 in the internal combustion engine is taken as another example, and the data discussed. The conclusion is reached that, once an equilibrium condition is attained in the burning of such a mixture, the equilibrium is maintained until all the gases have been burnt.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Concrete Roads.

SIR,—I read with great interest Mr. W. Millar's remarks on the subject of "Concrete Roads in Streets." "Sheer Madness" is certainly no exaggeration. Cannot those gentlemen who hold prestige in high places get down to it, and grapple unflinchingly with the matter, which I feel sure is giving us all a tremendous amount of "food for thought?"

E. M. BAIGENT,
General Manager and Secretary,
Crowborough District Gas and Electricity Company.

Station Road,
Jarvis Brook, Sussex,
Sept. 1, 1927.

A party of forty members of the local Engineering Society last week visited the Brighouse Corporation Gas-Works, and were shown over the plant by Mr. C. R. Ingham (the Manager and Engineer) and members of the staff.

REGISTER OF PATENTS.

Road Vehicles with Means for Clearing Syphons. No. 274,988.

TAYLOR, A., & CO., of Wandsworth, S.W. 18.

No. 12,700; May 18, 1926. No. 28,046; Nov. 8, 1926.

This invention relates to motor road vehicles carrying auxiliary pumps, adapted to be driven by the engine, for pumping liquids to or from a tank on the vehicle. The object is to provide improvements in connection with the mounting of the pump on the vehicle and the means of driving the same from the engine, and to provide an efficient and reliable arrangement adapted to enable small quantities of liquid to be pumped into a tank on the vehicle. The object more especially in view is to enable valuable bye-products, such as naphtha and the like, which accumulate in the manhole traps or sumps of gas mains to be recovered by pumping the contents of these traps into a tank on the vehicle.

According to the invention, the vehicle is provided with a rotary pump which is mounted on or adjacent the engine, and is driven through a hand or foot controlled friction clutch by a counter-shaft mounted coaxially with the pump and geared to the engine crank shaft either directly or through the intermediary of the engine fan shaft.

Details of the invention are described, illustrated, and claimed.

Geysers.—No. 275,074.

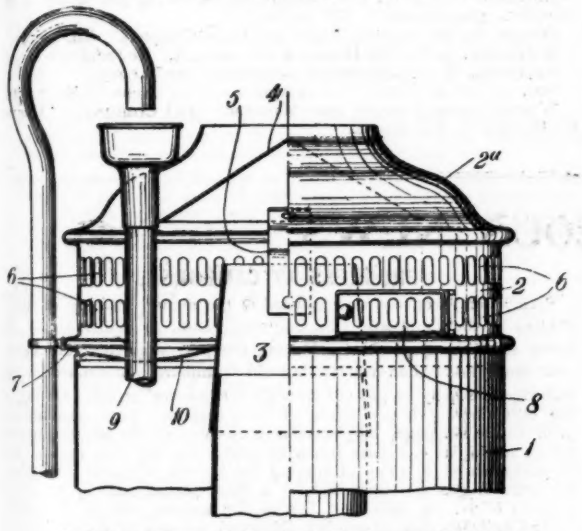
DAVIS, W. J., of Thornton Heath, and DAVIS ENGINEERING CO., LTD., of Norfolk Street, W.C. 2.

No. 78; Jan. 1, 1927.

This invention provides for a baffle or baffles actually within the shell of a geyser; the patentees claiming that thus expense is saved and possible unsightliness avoided. We reproduce a half-sectional elevation of one arrangement.

The outer cylindrical shell has fitted into its upper end a comparatively shallow cylindrical casing 2 having a concentric fume outlet 3 and an annular base plate 10 forming a partition round the outlet 3 between the shell 1 and the cylindrical casing 2.

The latter has a cap 2^a shaped to cause an up draught for drawing the fumes from the casing 2 and permitting them to flow up a chim-



An Internal Geyser Baffle—Davis Engineering Co., Ltd.

ney or other outlet; or, when circumstances permit, the fumes can escape directly into the atmosphere from the cap 2^a.

Disposed above the top of the fume outlet 3, which is preferably slightly conical to fit over the flue outlet of geyser, is a suitable baffle—for instance, the shallow conical metal member 4, which can conveniently be supported spaced from the upper end of the outlet tube 3 by a number of legs 5 secured to the baffle 4 and the outlet tube 3. To assist in the conduction of the fumes from the casing 2 through the top of the cap 2^a, apertures 6 are provided in the wall. An inspection door 8 is provided in the casing.

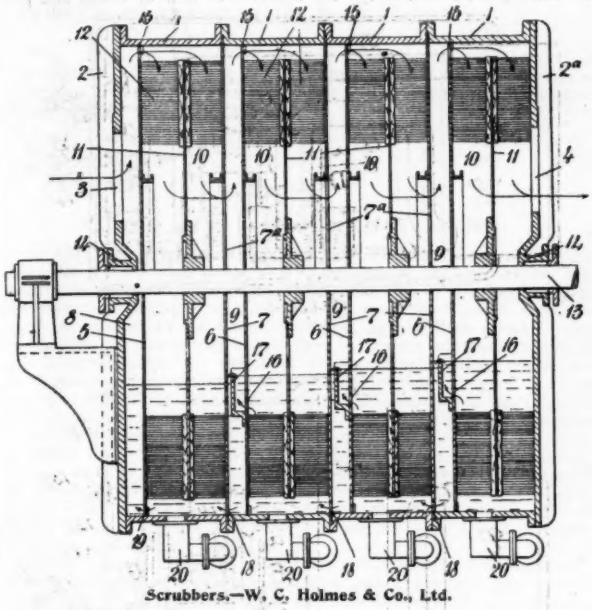
Scrubbers.—No. 275,092.

HOLMES, P. F., HENSHAW, D. M., and HOLMES, W. C., & CO., LTD., all of Huddersfield.

No. 3467; Feb. 7, 1927.

The object of this invention is to provide an improved or modified form of brush washer, in which the gases will be caused to travel through both sets of brushes located in a section and through a plurality of adjacent sections in the same direction. Normally the direction of travel of the gases through each of the chambers within which brushes are located will be from the periphery towards the axis of rotation of the brush-carrying members.

In accordance with the invention "still chambers" are located between adjacent sections; and these still chambers lead the gases from one section to the next, and from a point adjacent to the axis in one section to a point remote from the axis in the next section, or vice versa.



Scrubbers.—W. C. Holmes & Co., Ltd.

One construction is illustrated in the accompanying drawing. The casing is formed of a plurality of flanged annular members 1 connected together and to end plates 2 and 2a provided respectively with a gas inlet 3 and a gas outlet 4. Within the casing adjacent to the gas inlet a diaphragm 5 is located; and in addition three other diaphragms 6 and three diaphragms 7, each of the latter being provided with an opening 7a for permitting the passage of gas, are located within the casing The space between the diaphragm 5 and the end plate 2 forms the still chamber 8; while the space between each pair of diaphragms 6 and 7 constitutes the still chambers 9 intermediate between the sections 10 into which the chamber is divided and in which brush-carrying members 11 are arranged. These brush-carrying members are all mounted upon the shaft 13 rotatably mounted in bearings 14 in the end plates. The passage of gas from the still chamber to the sections 10 in which brush-carrying members are located takes place through openings 15 in the diaphragms 6, while the passage of liquid from one section to an adjacent section takes place by way of the openings 16 formed in the diaphragms 6, adjacent to which openings overflow devices or traps 17 are located. By way of these openings liquid may pass to or from a section to an adjacent still chamber, and from the still chamber the liquid may pass between the same and an adjacent section by way of the opening 18.

As will be understood, in the diaphragm adjacent to the end plate a similar opening 19 is provided permitting the liquid to flow into the corresponding still chamber. Each of the sections into which the device is divided is provided with a liquid outlet 20, which in the normal operation of the device may be closed.

Prepayment Gas Meters.—No. 275,510.

MCROBBIE, W., of Leith, and MILNE, J., & SON, LTD., of Edinburgh.

No. 7617; March 19, 1927.

This invention relates to the prepayment mechanism of the change-wheel type fitted to consumers' gas meters, and consists in the provision of a differential gear to work in conjunction with a suitable quantity indicator, a stop for the prevention of the insertion of more than a predetermined number of coins, suitable means for closing a valve, and measuring mechanism for indicating the quantity of gas prepaid.

The invention is fully described and claimed.

Furnaces for Metal Sheets.—No. 275,513.

BRITISH FURNACES, LTD., of Chesterfield, and SMITH, E. W., of Victoria Street, S.W. 1 (a communication from the Surface Combustion Company of New York).

No. 8072; March 23, 1927.

This invention relates to improvements in furnaces for heating metal sheets or plates; the object being to construct a furnace in which thin sheets may be uniformly heated without buckling or bending.

For this purpose the supports for the sheets are discs fixed to transverse shafts extending through the chamber and so arranged that at that part of the chamber which is the hottest the sheet receives most support—that is to say, at such part the discs on their respective shafts are closer together than at another part.

Other features of construction included in the invention are apparent from the description which accompanies the drawings in the specification.

Hydraulic Sealing Device for Water Gas Plant.

No. 275,490.

DEMPSTER, R. & J., LTD., and ANDREWS, C., both of Manchester.

No. 1906; Jan. 22, 1927.

The invention is for a compound hydraulic sealing device applied to water gas plant, whereby the direction of flow of steam and gas

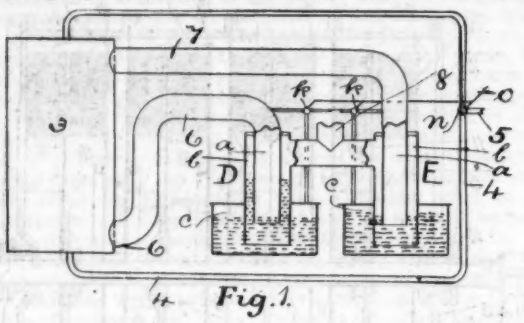


Fig. 1.

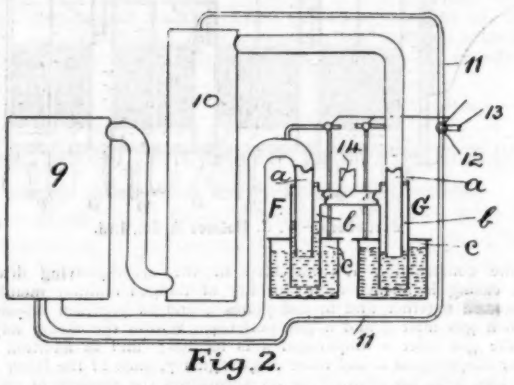


Fig. 2.

Hydraulic Control of Water Gas Plant.—R. & J. Dempster, Ltd.

may be controlled without the necessity of elaborate hot valves. Use is made of a known type of compound hydraulic sealing device, comprising three liquid compartments, or multiples of three.

Fig. 1 shows in sectional elevation an application of the invention to a blue water gas plant, and fig. 2 an application to a carburetted water gas plant.

Referring to fig. 1, a pair of sealing devices consisting of an inner pipe *a*, an outer pipe *b*, and external chamber *c* are shown at D and E, a generator at 3, the latter in pipe connection 4 with steam main 5. The device D has a continuation of compartment *a* in the form of piping 6 forming a connection between *a* and the bottom end of generator 3; while device E has a continuation of compartment *a* in the form of piping 7 forming a connection with the top end of the generator 3. Lever *o* in connection with steam valve *n* is shown in link connection with three-way valves *k* whereby pressure communications between *a* and *c*, of D or E, may be controlled. It will readily be seen that the conditions are suitable for flow of gas through device E, and not through device D—*i.e.*, for an up run. Reversal of the conditions enables the gas to flow into D and not through E—thus changing to a down run. A common outlet for gas is indicated at 8 in pipe connection with D and E.

In fig. 2, sealing devices are shown at F and G, a generator at 9, in pipe connection with a superheater at 10, the latter being assumed combined with a suitable form of carburettor. Steam pipe connections are shown at 11, a three-way steam cock at 12, and main for steam at 13. The bottom of the generator is shown in pipe connection with F, and the top of the superheater with G. The conditions shown are suitable for an up run. Reversal of the conditions will be suitable for the back run in the apparatus; the device F being capable of being traversed by the gas, and device G closed. A common outlet for the gas is shown at 14. It will thus be seen that through the piping or passages referred to, the devices D and E, or F and G, are in circuit with the gas communications; the liquid levels in the seals being controlled by valvular means in connection with the valve controlling the steam supply.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Aug. 31.]

Nos. 21,997—22,601.

COLEY, H. E.—"Low-temperature carbonization of coal." No. 22,313.

CUTLER, S.—"Dehydration of gas." No. 22,576.

FOSTER & PULLEN, LTD.—"Gas lamps." No. 22,413.

GAS LIGHT AND COKE COMPANY.—"Distillation of oils, &c." No. 22,542.

GILL, A.—See Foster & Pullen, Ltd. No. 22,413.

HARPER & CO., LTD., J.—"Means for regulating gas supply in atmospheric gas burners." No. 22,432.

POTTER, F. M.—See Gas Light and Coke Company. No. 22,542.

RETALLACK, J. F.—See Harper & Co., Ltd., J. No. 22,432.

ROBINSON, H.—"Gas heated radiators." No. 22,295.

SOC. DU GAZ DE PARIS.—"Gas heated cooking ovens." No. 22,567.

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.—"Gas or oil burners." No. 22,088.

MISCELLANEOUS NEWS.

CORK GAS COMPANY.

The accounts for the half-year to June 30, which were submitted at the recent meeting of proprietors, showed a satisfactory increase in the receipts from the sale of gas, as compared with the corresponding six months of 1926; and the Directors are anticipating a further expansion in sales during the current half-year, as a result of the reduction which has been made in the price. The balance of profit was £7624. The payment of the ordinary dividend at the rate of 8 p.ct. per annum, and 2s. per share as supplementary dividend for Dec. 31, 1901, on the paid-up capital at that date (which dividend was at a reduced rate), will leave £388 to be added to the reserve fund. The Chairman (Mr. W. B. Harrington) pointed out that the sale of gas was nearly 23 million c.ft. up, which represented an increase of almost 14 p.ct.

As to gas cooking, the Chairman said: "The sale of gas stoves continues very satisfactory; and we fixed 316 during the half-year. The advantages of gas stoves respecting economy, cleanliness, and convenience are now so well known and appreciated that they sell themselves, so to speak. In connection with this department, our annual cooking examinations were held in three girls' schools in the city during the months of May and June last; and a large number of pupils were examined in the practical use of gas cooking stoves. The Examiner (Miss O'Callaghan) reported very favourably on the standard of efficiency reached by the pupils, who, young as they were, displayed a comprehensive knowledge of the uses of the gas cooker highly creditable to themselves and to their teachers."

Continuing, he stated that, in pursuance of the Company's policy of increasing sales by selling gas at the lowest possible price, a reduction of 1d. per therm was made as from the midsummer meter readings; and, if nothing unforeseen occurs, the Directors intend to announce a further reduction in the near future.

Reference was made by the Chairman to the recent successful meeting in Cork of the Irish Association of Gas Managers, and to the interesting and able address delivered by Mr. Joseph McNicholl (Engineer and Manager of the works) on that occasion. On this subject, the Chairman remarked: "There was a very large attendance of representatives from all parts—about a hundred, I think. Our Mr. McNicholl, who presided at the various meetings and functions, happened to be President of the Association for the past twelve months; and we gave him *carte-blanche* to do everything in his power to give these visitors an enjoyable time. I think, from what I heard, they all left Cork with pleasant recollections of their visit." In this surmise, the Chairman was perfectly correct.

PROGRESS AT CAMBORNE.

Satisfactory progress was reported at the annual meeting of shareholders in the Camborne Gas Company, Ltd., at which Mr. J. R. Rowe (Chairman) presided. During the past year coal, of course, cost much more than usual; but the Company maintained an uninterrupted supply of gas all through the miners' strike. Owing to the exceptionally heavy stock of coal that had been accumulated prior to the stoppage, they were able to carry on for several months before having to purchase imported coal; and for this reason, and in pursuance of a policy of sharing the burden with the consumers, the price of gas was increased for a short period only by the small amount of 3d. per 1000 c.ft. During the meeting, Mr. S. J. Ingram (Vice-Chairman and Managing Director) announced the decision of the Directors to remove this 3d. as from Oct. 1. During the year the Company sent out 3½ million c.ft. more gas than in the previous twelve months. A dividend of 6 p.ct., less income-tax, was declared.

NEW SHOWROOMS AND OFFICES.

On the day that the meeting was held, new showrooms and offices were formally opened, in the presence of a large gathering, by Miss Rowe (daughter of the Chairman), who was introduced by Mr. Ingram. After considerable negotiations, the Directors succeeded in purchasing the freehold of the Company's premises in Trelowarren Street; and they at once set about adapting the building to the purposes of the business.

Facing Trelowarren Street, a new shop front of French mahogany, with sashes of bronze metal on wood coves, and blue Belgé marble stall risers, has been erected. On the right of the main entrance is a plate-glass window about 17 ft. wide, where ample room will be provided for display purposes. On the left is a new office for the Secretary of the Company. On the ground-floor has been fitted model kitchen equipment consisting of a coke boiler and a gas cooker. Also on the ground-floor are a cashier's office and a counter in fumed oak. Leading from the ground-floor to the first floor is a well-designed staircase in oak, with iron balustrading. On the landing is an antique fireplace of Dutch sand-faced bricks, in which is fitted a gas fire. At the sides are fixed oak seats; the whole comprising an attractive inglenook. On this floor is a well-arranged showroom, in which are displayed fires, cookers, geysers, irons, &c., in varied and appropriate settings. Here also are shown gasfittings for lighting purposes, with different shades and finishes.

ENCOURAGING GAS CONSUMPTION AT BRADFORD.

An Instructive Report.

The Engineer and Manager of the Bradford Corporation Gas Department (Mr. Ernest J. Sutcliffe) has submitted to the Gas Committee a highly interesting report, which presents the case for the application of modern practices to the development of the consumption of gas. The Committee on the 2nd inst. unanimously adopted Mr. Sutcliffe's recommendations; and, subject to confirmation by the Council on the 13th inst, they will be put into immediate operation.

A study of "Field's Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland for the year 1926" gives grounds for the belief that there is great scope for an increase in the volume of gas consumed per customer in Bradford. The table given below shows the number of therms consumed per annum per ordinary and prepayment consumer, and the average for each private consumer in the areas mentioned:

—	Ordinary Meter Consumer.	Prepayment Meter Consumer.	Total Private Consumer.
	Therms.	Therms.	Therms.
3 Metropolitan gas companies .	296·92	128·66	193·40
7 Suburban " " .	225 90	125·50	173·45
9 Provincial " " .	225·01	111·02	175·64
11 Municipal undertakings . . .	206·61	102·31	160·70
BRADFORD	105·65	57·57	103·59

The large difference between the consumptions by consumers in companies' areas and those in corporation areas is largely due to the fact that the former authorities, by being able to develop the use of gas by letting-out on hire gas apparatus of all kinds, fitting-up houses, undertaking gasfitting work on the hire system and other similar means, have popularized and encouraged the use of gas to an extent that is not general with municipal authorities.

From these figures it will be obvious that there is plenty of scope for pushing the use of gas for every domestic purpose in Bradford; and the Committee have taken the right step in deciding to recommence the letting-out of cookers and fires on the hire system as a commencement. Much, however, remains to be done in order to bring Bradford into line with other large undertakings throughout the country; and this report has been prepared in order to point out some means by which this may be furthered.

RESTRICTIONS.

When the Corporation acquired the works of the Bradford Gas Light Company in 1871, they were authorized, by the Bradford Corporation Gas and Improvement Act, 1871, sanctioning the purchase, to require that

Every consumer of gas supplied by the Corporation shall upon the request of the Corporation consume the gas so supplied by meter provided by the Corporation at the expense of the consumer. (Sec. 26.)

Every consumer of gas supplied by the Corporation shall at all times, and at his own expense, keep all meters used by him whereby any gas of the Corporation is measured and registered in proper order for correctly measuring and registering such gas in default whereof the Corporation may cease to supply gas through such meter. (Sec. 27.)

With comparatively few exceptions, the Corporation have always acted, in the old city area, upon the powers here given them, and have insisted upon the consumer purchasing and maintaining his meter, and until recent years the system has given little trouble. Since the scarcity of houses which followed the conclusion of the war, however, many builders have objected to do this, and, in some instances, have told the house buyer that he must purchase his own meter; and in others have insisted also on him paying for any additional length of service above the 30 ft. laid free. As a consequence, houses have been built during the last few years without a supply of gas, and in some no meter has been fixed even after we have run the service; this applies more particularly to the houses above about £550 value. This is the type of house in which our best consumers are found, and that the occupier should be deprived of the great benefits of gas because the builder does not choose to supply a meter or meet a charge for an increased length of service is not in the best interests of either the occupier or the Corporation.

The exceptions mentioned above are mostly cases in which the consumer has desired to put in a cooker or other apparatus, but where the meter (the landlord's property) was too small to pass the necessary volume of gas, and the landlord declined to put in a larger one to suit the tenant's requirements. In such cases, the practice for a number of years has been for the Corporation to let on hire to the tenant a meter of suitable size; for it was obviously bad policy to let such a small matter stand in the way of increased business, as it had done previously. Many meters in use by large consumers for industrial purposes have also been on hire since the days of the Bradford Gas Light Company. On the acquisition of the rights of supply of the several Gas Companies whose areas were added to the city in 1899, the Corporation accepted and maintained the conditions and positions then existing regarding meters in these areas. The Companies had in some cases sold meters outright, as in Bradford, and in others had let them out on hire to the consumer. On April 1, 1927, the number of ordinary meters on hire in the different parts of the city was:

Bradford	710
Low Moor	3884
Clayton	1920
Eccleshill	106
Idle	679
Heaton and Frizinghall	150
	7449

In addition to these, some of the Companies had made a practice of providing prepayment meters in suitable cases; the present numbers in use being:

Low Moor	2139
Clayton	214
Idle	1079
	3432

In 1914, the Bradford Ratepayers' and Property Owners' Association sent a deputation to the Gas Committee of the Corporation asking to be relieved of the responsibility and cost of keeping in repair gas-meters in cottages; and on Oct. 13, 1914, the Council, upon the recommendation of the Gas Committee, agreed "to maintain free of charge all gas-meters in cottages in respect of which landlords are responsible for the collection of gas accounts after the meters are transferred by the landlords to the Committee in good working order." Since that date, the landlords have handed to the Corporation nearly 13,000 meters out of the 44,000 which the deputation stated had been provided in houses which came under the compounded rate. Many landlords who have not handed their cottage meters over to the Corporation have of late years made a practice of refusing to repair a meter when it becomes faulty. The same thing often occurs in regard to leaking gas-fittings in houses. In these cases, unless the tenants are willing to pay the cost of repair, they are left without gas.

Other landlords, having had considerable trouble due to the tenants falling into arrears with their weekly payments for gas, have refused to be any longer responsible for the collection of their gas accounts. The Department, having to give six months' credit, quite reasonably insists upon the tenant-consumers paying a deposit before supplies are granted them; this being the usual practice throughout the country. In many cases they are either unable or unwilling to pay this deposit; and consequently they are deprived of a supply of gas. In many instances, when tenants have got into arrear with their rent, landlords have given us notice to cut-off the gas, in order to bring the tenants to a sense of their responsibilities; some of these are not reconnected subsequently.

In addition to all the above, there are, of course, those consumers directly responsible for their gas accounts who are unable to pay; and, as a last resort, the gas is cut-off in these cases.

I give below a statement showing the number of consumers in all classes of premises whose supply had been cut-off, and the reason for the same up to 1925; and for purposes of comparison, the numbers up to June, 1927:

—	1925.	1927.	Increase or Decrease during the Two Years.
Not paid deposits	501	319	182 decrease
Not paid accounts	817	1379	562 increase
Faulty meters	236	200	36 decrease
Bad fittings.	214	225	11 increase
Cannot afford gas	71	75	4 increase
Owners' orders	790	504	286 decrease
Cause not stated	284	273	11 decrease
Electric light	1341	2031	690 increase
Empty properties	No record	896	..
Condemned properties	No record	617	..
	4254	6519	

1927	6519
1925	4254
	2265
Less for empties and condemned.	1513
Total increase of supplies cut-off.	752

It will be seen that, apart from empty and condemned property, there was a direct loss of 752 consumers during the two years, most of whom might have, and ought to have, been retained. (Against this, however, must be placed 3396 consumers who had gas laid on to new property during the period.)

METERS ON HIRE WITHOUT RESTRICTION.

It is essential that this leakage of business be stopped; and, in order to bring it about, I respectfully submit the following suggestions:

1. That the Corporation let out meters on hire without restriction to all consumers who may make application; hiring being optional. (Power to let out meters and fittings on hire was granted to the Bradford Gas Light Company in section 40 of their 1845 Act.) The following scale of charges has been drawn up on a basis of 10 p.ct. on the cost of tin-cased dry meters. A wet meter is more satisfactory in certain places, but costs more. Its life, however, is much longer than that of a dry tin-cased one; and, therefore, the same rent might

be charged—the reduced percentage on cost being more than recovered by the longer life:

Ordinary Meters.

Size.	Capacity.	Yearly Rental.
	Ft.	£ s. d.
3-lt.	18	0 4 2
5 ,,	30	0 4 8
10 ,,	60	0 6 0
20 ,,	120	0 9 4
30 ,,	180	0 12 4
50 ,,	300	0 18 8
60 ,,	360	1 4 0

Standard Meters.

Size.	Capacity.	Yearly Rental.
	Ft. per Hour.	£ s. d.
No. 2	40	0 4 2
No. 3	60	0 4 8
No. 4	120	0 6 0
No. 4A	180	0 9 4
No. 5	210	0 12 4
No. 5A	315	0 18 8
No. 6	420	1 4 0

It will be seen from these figures that the standard meters are of a much greater capacity than ordinary meters of the same price; and their adoption should, therefore, be recommended, up to the sizes quoted.

A difficulty in regard to meters handed over by owners to the Corporation is foreseen. Where the meter handed over becomes irreparable, I think it should be understood that no rent should be charged during the lifetime of that meter; but, should the meter wear out altogether, hire charges should be made for the new meter provided by the Corporation.

It is sometimes argued that it is unreasonable to charge a rent for the instrument by which the sale of gas is registered, as it would be unreasonable for a grocer to charge extra for the use of his scales. It must be pointed out, however, that the grocer is not required to provide a pair of scales for each customer; and the analogy, therefore, is not a fair one. If meters are let out free, their cost and maintenance must inevitably come out of the receipts for gas. This is not so equitable as the charging of meter-rents, for in the former case a consumer with a small meter may burn gas continuously, and another may have a large meter but only use gas occasionally or as a stand-by. The former will then obviously be paying, in his gas bill, something towards the cost and maintenance of the meter of the latter. The principle of charging meter-rents is, therefore, sound, and the charge is an equitable one.

PREPAYMENT METERS.

2. In order to cater for the classes of consumers who cannot deposit security or who do not wish to incur the responsibility of a half-yearly account, the adoption of the prepayment meter is suggested.

These meters are largely used all over the country; but the necessity for their use has not arisen in Bradford until recent years, because of the fact that for practically all cottage houses the landlord was held responsible for the gas consumed by the tenant, who, in turn, paid a weekly sum to the landlord. The landlords have in large numbers of instances repudiated this responsibility; and, in consequence of this and the reasons previously given, we have lost many consumers who wish to have a supply of gas. The supply through prepayment meters (which are made to take either 1d. or 1s. to suit all classes of consumers) would prevent an extension of this kind of lost business, and would no doubt help to recover some already lost, as it would remove the objections to the present system—purchase of a meter, half-yearly accounts, payment of deposit, &c. The extra cost of the installation and subsequent collection of money would be recovered by an additional charge of 1·4d. per therm, or 7d. per 1000 c.ft. (This has been the practice of the Corporation in the out-districts in which some of these meters were in use prior to the Corporation taking them over, as previously mentioned.) It might be policy to consider later the letting out of a cooker or some other apparatus to prepayment meter consumers at a further increased charge for gas.

CHARGES FOR GAS SERVICES—25 YARDS FREE.

Upon application for a supply of gas to premises being made, the Corporation have, until last year, acted upon the powers granted them in section 11 of the Gas-Works Clauses Act, 1871, which states that the gas undertaking

shall, upon being required so to do by the owner or occupier of any premises situate within twenty-five yards from any main of the undertakers, or such other distance as may be prescribed, give and continue to give a supply of gas for such premises, under such pressure in the main as may be prescribed, and they shall furnish and lay any pipe that may be necessary for such purpose, subject to the conditions following (that is to say) the cost of so much of any pipe for the supply of gas to any owner or occupier as may be laid upon the property of such owner or in the possession of such occupier, and of so much of any such pipe as may be laid for a greater distance than 30 ft. from any pipe of the undertakers, although not on such property, shall be defrayed by such owner or occupier.

The Corporation have, under this clause, charged for the extra length above 30 ft. from the nearest main.

In pre-war days, when rows and terraces of new houses with small gardens were the rule, a charge for extra length was the exception. Many of the houses which have been erected since the war have long gardens, and often the gas services have had to be run to the sides or the backs of the houses. In these cases, the extra length was charged for until June, 1926, when it was arranged that, if the builder would make provision for a gas-cooker, the charge for any extra length would be halved. In a few isolated cases, houses have been built without a supply of gas; but recently we have been told that no provision is being made, or is intended to be made, in a number of houses in two districts in the city, as electricity is the only source of fuel and light which the builder will supply; he will not provide either gas service or gas meter. It is fairly obvious that, if the service is not laid when the house is built, it will be difficult to persuade the owner to put it in when the gardens are set-out and paths made.

Under the circumstances, therefore, I think the time has arrived when the policy of the Corporation regarding their charges for services should be modified to suit the changed conditions of the day; and would respectfully suggest that services of ordinary length, say up to 25 yards, should be laid free.

CONCLUSION.

In conclusion, I am of opinion that if the recommendations suggested herein:

1. The letting out of meters on hire as an alternative to the present system;
2. The adoption of the prepayment meter to those consumers who prefer them, or who cannot pay a deposit;
3. Increasing the length of service-pipe provided free from 10 yards to 25 yards,

are adopted, then many old consumers may be retained, those lost temporarily may be recovered, and business generally may be stimulated and revived in such a way as would be impossible if present conditions and customs are maintained. It may be added that a large increase in consumption per consumer can be met without a corresponding increase in existing plant.

E. J. SUTCLIFFE,
Gas Engineer and Manager.

Gas Engineer's Office,
Town Hall, Bradford, Aug. 24, 1927.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDER.

Dewsbury Corporation.

To authorize the borrowing of further money for the purposes of the undertaking.

RESULTS AT OSWALDTWISTLE.

In his third annual report to the Oswaldtwistle Urban District Council Gas Committee, Mr. A. F. Ames (Engineer and Manager) states that there was an increase of nearly 12 million c.ft. in the quantity of gas sold for the year ended March 31 last, as compared with the previous twelve months. The actual quantity sold was 119¾ million c.ft.; the increase representing 10·84 p.ct. Not only was a satisfactory supply of gas, as regards both pressure and quality, maintained during the coal stoppage, but no restrictions were placed upon its use. "It is," says Mr. Ames, "very satisfactory to note the increase in the quantity of gas used since the strike ended, thus showing that consumers have realized the value of gas, and have extended their use of it." The new carbonizing plant has given exceptionally good results, and has enabled the Department to come through an extremely difficult period with very favourable financial results. During the coal strike, it was found possible to carbonize any class of coal received, and get the utmost value from it.

As to the public lighting, it is stated that the saving in lamplighters' wages during the past two years, since the installation of clockwork controllers, has been £434, which has more than paid the cost of the installation.

A net profit of £3138 compares with £1567 for 1925-26.

Halifax Gas College Successes.—Of the winners of the prizes awarded by the Society of British Gas Industries in connection with the last City and Guilds of London Institute Examinations (particulars of which will be found elsewhere in this issue of the "JOURNAL"), we learn from Mr. Arthur Coe, the Principal, that three were students of the Gas College, Halifax. They were Mr. K. E. Tiddy, Bedford (second prize, Gas-Works Practice); Mr. W. R. S. Shadbolt, Grays (first prize, Gas Supply Practice); and Mr. K. G. Eccleshare, Derby (second prize, Gas Supply Practice).

City of Chichester Gas Company.—Mr. W. A. Walker (the Chairman), presiding at the half-yearly meeting of the Company, said that, in spite of the increased expenditure upon coal, it was possible to present a fairly favourable statement, owing to the continued excellence of the working results. The price of gas had been reduced, as from July 1, by 1d. per therm. Dividends were declared for the half-year to June 30 at the rates of 10 p.ct. per annum on the "A" capital stock and 7 p.ct. per annum on the "B" and "C" capital stocks—all less income-tax.

Langley Mill and Heanor Gas Company.—The Directors of the Langley Mill and Heanor Gas Light and Coke Company, Ltd., in their annual report, state that, after deducting dividends paid on Sept. 1, 1926, and on March 1, 1927, the profit and loss accounts show an available balance of £9726, out of which it is recommended that a further dividend of 6s. per share be paid on the "B" shares, 4s. 6d. per share on the "C" shares (making 12 p.ct. and 9 p.ct. respectively for the year), 2s. 6d. per share on the "A" preference shares, and 3s. per share on the "D" 6 p.ct. preference shares, less income-tax. It is also recommended that the sum of £325 be transferred to the reserve fund, and that the balance be carried forward to next year's account.

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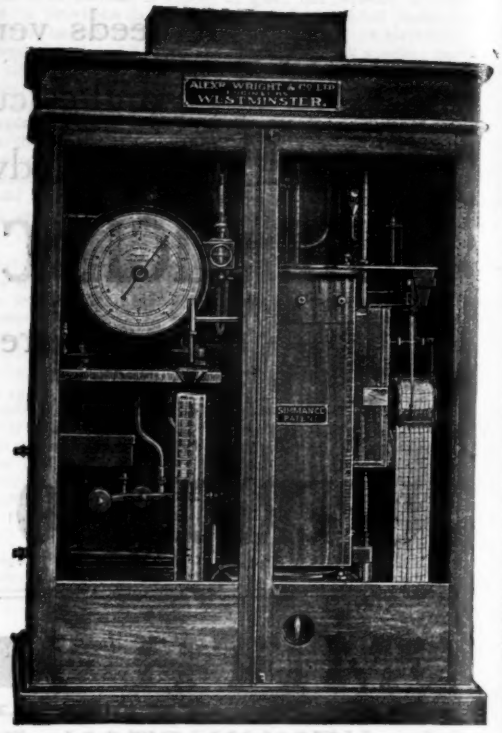

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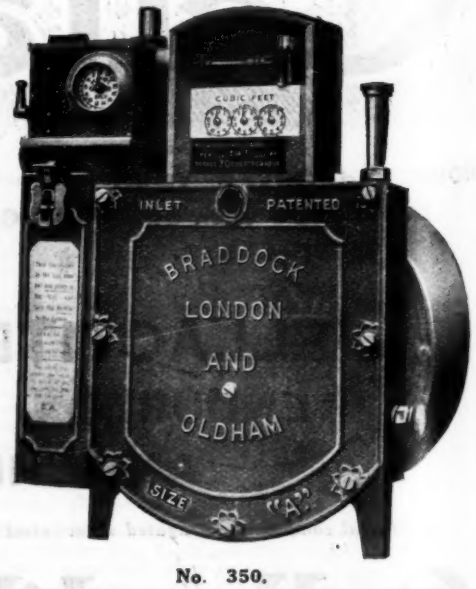

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SO-CALLED "DEFICIENCIES" IN THE COAL INDUSTRY

Mr. Philip Gee, Director of the Colliery Owners' Publicity Department, has issued the following statement:

In considering the published statistics relating to the coal industry, many people are confused by the term "deficiencies." Wrong conclusions have consequently been drawn from the assumption that deficiencies are the same as trading losses, and the amount of the said "deficiencies" has been quoted as the trading loss of the industry for the first six months of the year. What the trading results may be it is impossible, as yet, to say with complete accuracy; but so far from there being a loss of about £4,500,000, it is probable that, when complete figures are available for all districts, a profit of some hundreds of thousands of pounds will be shown. This compares with a trading loss, excluding the subsidy, of £4,200,000 for the first three months only of 1926 under the seven-hour day.

The deficiencies to which reference is made are not trading losses, but book entries. Under the agreements governing wages in the coal industry, the divisible proceeds of the industry are allotted to wages and profits in agreed proportions (either 85 to 15 or 87 to 13). The intention of this is to secure that the prosperity of the industry shall be reflected in the wages of the men, and that wages and profits shall move upwards and downwards together. In fact, when times are bad and proceeds fall, the amount allocable to profits is required to make up the minimum wage which the miner is guaranteed however bad trade may be; and the amount thus transferred from paper profits to actual wages is termed a "deficiency." Under the agreement, such deficiencies are recoverable out of any future surplus before wages move upwards above the minimum mark; but under the agreements of 1921 and 1924, it was the unfortunate experience of the owners that similar deficiencies were not in fact recovered.

Incidentally, it may be noted that in the "Summary of Ascertainments for May and June, 1927," published in the supplement to the "Miner" of Aug. 27, the identical figures relating to South Wales contained in the supplement of June 25 for February, March, and April are reproduced. The explanation is given in small print at the foot of the summary. It is advisable, therefore, that readers, before jumping to conclusions, should scrutinize the statements of the Miners' Federation with unusual care, including those "explanations" in the smallest type.

TRADE NOTES.

Renold Chains.

There has been forwarded by Messrs. Hans Renold, Ltd., of Burnage Works, Didsbury, Manchester, a new price list of Renold products, announcing price reductions which are now operative. Various additions, the list shows, have been made to the range of these products.

"Pifco" Fittings.

The new season's complete catalogue, just issued, of the Provincial Incandescent Fittings Company, Ltd., of Pifco House, 71, High Street, Manchester, comprises over 150 fully illustrated pages descriptive of their manifold specialities for gas, oil, and electricity, &c. The gas section includes globes, mantles, burners, shades, and various fittings for lighting and heating.

"Sulzer Technical Review."

The latest issue of the "Sulzer Technical Review"—an excellently got-up publication by Messrs. Sulzer Bros., of 31, Bedford Square, London, W.C.—has arrived in a convenient specially-made cover, arranged for binding the previous and forthcoming issues. This will certainly prove useful for keeping together the numbers of the review, which are devoted to illustrated descriptions of work of far more than passing interest.

"Quasi-Arc" Electric Welding.

A circular has been prepared by the Quasi-Arc Company, Ltd., of 15, Grosvenor Gardens, London, S.W., describing "Quasi-Arc" welding plants. There is a short preface explaining the principles of electric welding with "quasi-arc" electrodes, which are the main manufactures of the firm. The plants are simple in operation, and capable of adjustment for all forms of welding on both light and heavy work. Particulars of the employment of the system on gasholder welding have already been given in the "JOURNAL."

Hagan and Hall Patents.

Messrs. James Gordon & Co., Ltd., of Windsor House, Kingsway, London, W.C., announce that they have taken over the complete patent rights for the British Empire, except Canada, and also for all other European countries and their colonies, of the Hagan patent automatic regulation for combustion boiler houses, &c., the Hall patent system of boiler water conditioning, and the Hagan patent steam separator. The new Hagan Department is under the management of Mr. J. E. O'Breen, who had a wide experience with different apparatus during the time he was with the Hagan Corporation of Pittsburgh (Pa.).

CONTRACTS OPEN.

Coal.

The Gas Committee of the Borough of Darwen are inviting tenders for the supply of rough gas slack and nuts. [See advert. on p. 570.]

The Kirkintilloch Corporation are now able to supply gas to the neighbouring district of Milton-of-Campsie. In less than a month they have laid about 3000 ft. of pipes.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The market continues to live on optimism rather than on any actual improvement in trade. There are still the inquiries for forward delivery over all sorts of periods, still the same firmness in colliery quotations, but always the anxiety as to how to fill the next week's turn. As regards gas coal, there is, of course, seasonal demand to take into consideration, and this may be reasonably expected to help the particular section of the market. Apart from this, it is difficult to see where any improvement is likely, except in the hope that the Continent really will buy when it is seen that prices cannot be further reduced.

Current quotations show little alteration, Wear Special gas asking about 16s. 3d. f.o.b., and best qualities 16s. Seconds are about 14s. to 14s. 6d. Durham coking is still out of favour, and plenty of good coal is obtainable at 13s. 6d. for prompt shipment, though 14s. is asked for forward positions. Best Durham bunkers are not quite so good, and are about 3d. cheaper on the week at 14s. 3d.; ordinary bunkers being freely offered at 13s. 6d. to 13s. 9d. Northumberland steams are quoted at 14s. 3d. to 14s. 6d. for best screened sorts, with smalls at about 10s. 3d.

Gas coke is clearing well, and 20s. 6d. to 21s. f.o.b. is easily maintained as shipment price.

YORKSHIRE AND LANCASHIRE.

Gas-works are calling for increased supplies, and collieries in Yorkshire and Lancashire will now be able to extend their working hours.

There is no improvement in the demand from other industrial consumers. The general lack of confidence is apparent throughout the country. Whether or not rebates on iron and steel lately introduced will lead to some revival in these sections of the trade is problematical.

The export market is a national problem, and it is very difficult to judge what effort will be needed to bring about an improvement. The West and South Yorkshire coalowners, in conjunction with exporters, are to put a scheme forward very shortly.

There are signs that householders are now buying domestic fuel more freely, and it is anticipated that the present month will show a considerable improvement in this direction, especially as small stocks are generally on hand.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 17s. 3d. to 17s. 6d.; screened gas coal, 16s. to 16s. 6d.; washed trebles, 16s. 9d. to 17s. 6d.; washed doubles, 16s. to 16s. 3d.; washed singles, 15s. 4½d. to 15s. 7½d.; washed smalls, 11s. 9d.; rough slack, 10s.; smithy peas, 17s. 3d. to 18s. per ton. West Yorkshire—Hartley's (f.o.b. Goole), 14s. 9d. to 15s. 3d.; screened gas coal, 15s. to 15s. 9d.; washed trebles, 16s. to 16s. 6d.; washed doubles, 15s. to 15s. 6d.; washed singles, 15s. to 15s. 6d.; washed smalls, 11s. 6d. to 11s. 9d.; unwashed trebles, 15s. 3d. to 15s. 9d.; unwashed doubles, 12s. 6d.; coking smalls, 10s. to 10s. 6d. per ton. Derbyshire and Nottinghamshire—Top hards, 17s. 6d. to 18s. 9d.; washed doubles, 16s. to 16s. 6d.; washed singles, 15s. 3d. to 15s. 6d.; washed smalls, 11s. 6d.; rough slack, 10s. to 10s. 6d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 15s. to 15s. 3d.; gas coke, 19s. 6d. to 20s. 6d.; furnace coke, 19s. per ton.

Quotations in Lancashire: Lancashire best house coal, 30s. to 33s.; seconds, 28s. to 30s.; common, 19s. to 21s.; kitchen, 22s. to 24s.; Yorkshire Haigh Moor house, 30s. to 32s.; house, 28s. to 30s.; cobbles, 19s. to 20s.; washed doubles, 13s. to 14s.; washed singles, 12s. to 13s.; rough slack, 8s. to 10s. per ton in wagons at pit.

MIDLANDS.

September has brought no perceptible improvement in the trade. Pits in the Cannock Chase district are working only three to four days a week. In other Midland coalfields the average is probably somewhat higher.

There has been no real attempt to change the basis of prices. The inertness of the market has conclusively forbidden any upward movement. If householders are making any provision for the autumn and winter requirements, the effect on the general volume of demand is inappreciable. One or two collieries which tentatively raised the price of special grades by a shilling or so have not thought it expedient to experiment further.

There is no hint of reinvigoration of the industrial demand. Spot lots are still offered at such prices as 6s. or 7s. for 1¼-in. slacks, 8s. for beans, and 9d. for D.S. nuts. Steams can be bought at 11s. to 15s. Industrialists realize that they are not likely to improve upon the terms which they can now obtain; but big consumers in the metallurgical branches will not take the risk of buying in advance of actual requirements, and few of them have more than two or three weeks' work in hand.

Blast-furnace coke can be bought for prompt delivery at 12s. 6d. to 13s. 6d. at the ovens. These terms are also obtainable for contracts till Christmas.

Reduced Price at Cheltenham.—The price of gas in Cheltenham has been reduced for the December quarter to 9½d. per therm, or 3s. 7½d. per 1000 c.ft. The new price is less than that obtaining prior to the strike last year.

Gas Supply of Broxburn.—The Broxburn Gas-Works, which have been shut-down since November, 1925, in consequence of the shale miners' strike, have been acquired by the Mid-Calder Gas Company. The want of gas in the district has been much felt, and the prospect of a renewed supply will be welcomed. It is expected that the new supply from coal gas retorts will be available in about two months.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 5.

There is little change to report in the London tar products market, and values generally are unchanged.

Current prices are: Pitch, 92s. 6d. to 95s. per ton; creosote, about 8¼d. per gallon; pure benzole, 1s. 5d. to 1s. 6d. per gallon; pure toluole, 2s. per gallon; solvent naphtha 95/160, 1s. 3d. to 1s. 4d. per gallon; and pyridine bases, 6s. to 6s. 6d. per gallon.

Tar Products in the Provinces.

Sept. 5.

Markets for tar products have remained very firm throughout the week.

The pitch market is still firm, and Continental inquiries are beginning to come forward.

The creosote market is very steady indeed, and the inquiry for both home and export continues.

Tar acids remain firm. There has been an improvement in the price of crude carbolic; while cresylics of all grades are inquired for.

The average prices of gas-works products during the week were: Gas-works tar, 65s. 9d. to 70s. 9d. Pitch—East Coast, 90s. to 92s. 6d. f.o.b. West Coast—Manchester, 85s. to 87s. 6d.; Liverpool, 87s. 6d. to 90s.; Clyde, 89s. to 91s. 6d. Benzole, 90 p.ct., North, 1s. 2d. to 1s. 3d.; crude, 65 p.ct. at 120° C., 10¼d. to 10½d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 3d. to 1s. 4d. Toluole, naked, North, 1s. 4d. to 1s. 5d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 8½d. to 9½d. Heavy naphtha, North, 10d. to 1s. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 7⅜d. to 7½d.; Scotland, 7¼d. to 7⅜d. Heavy oils, in bulk, North, 8¼d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 6d. to 2s. 7d. prompt. Naphthalene, £11 to £14; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Doncaster and the Thorne Gas-Works.—The Doncaster Corporation Gas Committee, after considering an offer by the Thorne Gas Light and Coke Company, Ltd., to dispose of their undertaking to the Corporation, asked the Gas Engineer and the Chairman of the Gas Committee to visit the works. Having heard their report, the Committee do not favour the purchase.

Glasgow Lighting Department.—Reporting on the work of the Lighting Department of the Corporation of Glasgow for the year ended May 31 last, Mr. S. B. Langlands (the Inspector of Lighting) says that, in spite of interference caused by the coal stoppage, there has, generally speaking, been continuous progress (1) in the raising of the standard of lighting in the main thoroughfares from a degree of illumination previously satisfactory to that demanded by present traffic, and (2) in the lighting of new streets and of new common stairs in housing schemes. There were at the end of the year 23,510 public street gas lamps, and 6410 public street electric lights. The total candle power of lamps lit in the streets was 5,035,000, while the total mileage of streets lit was 549.

Morpeth Gas Company.—In spite of the troublous times, the gross profits of the Company for the year ended June were only about £365 below the high record of the previous twelve months. At the meeting, the Chairman (Major Ralph Crawford) said it was a matter of satisfaction to them that they had felt justified in not only taking off the 1s. increase in the price of gas necessitated by the miners' stoppage, but also in making a further reduction of 6d. per 1000 c.ft. This made the price of gas only 28½ p.ct. more than the pre-war price of 3s. 6d. The dividend on the ordinary shares is 7 p.ct. for the year, free of tax. Councillor W. Grey (who said he was present representing the Borough of Morpeth) proposed a vote of thanks to the Chairman, Directors, and officials. This was seconded by the Town Clerk and heartily carried.

Taunton Gas Company.—Mr. R. Bruford (the Chairman) presided at the annual meeting, on Aug. 26, of the Taunton Gas Company. He stated that the extra cost of coal and oil during the year was £9000; but thanks to good management, they had been able to carry on without increasing the price of gas or reducing supplies. Higher receipts from residuals, and an increased output, had helped to bring about a satisfactory condition; and the amount available for the payment of dividends was £4113. The Directors recommended the payment of dividends on an unreduced scale of from 5 to 9 p.ct., according to the character of the stock; the lowest dividend being on the 1917 preference stock and the highest on the consolidated "A" stock. Only £800, he mentioned, had been taken from the carry-forward account to enable the full dividends to be met. The recommendations were adopted.

Price Reductions in Scotland.—The Airdrie Corporation Gas Department have reduced the price of gas from 5s. 4d. to 4s. 4d. per 1000 c.ft. At Maybole there is a reduction of 1s. 3d.—from 7s. 8½d. to 6s. 5½d. per 1000 c.ft. The change takes effect as from the last reading of the meters in May. The charge at Largs has been lowered from 5s. 10d. to 4s. 7d. per 1000 c.ft. The reduction comes into operation in November. The West Calder Gas Company have reduced the price by 5d. per 1000 c.ft. The price for power is now 6s. 3d. and for lighting 7s. 1d. The Rothesay Town Council have decided to reduce the price from 5s. to 4s. 2d. per 1000 c.ft., with 10 p.ct. discount for immediate payment. The Perth Town Council have agreed to a reduction of 3d. per 1000 c.ft., which makes the charge 5s. 6d. In Gourock the price has been lowered by 8d. per 1000 c.ft. The Saltcoats Gas Company are reducing the charge from 5s. to 4s. 7d. per 1000 c.ft. A further reduction to 4s. 2d. is to take effect in December.

Leatherhead Gas and Lighting Company.

The Directors, in their report for the year ended June 30, congratulate the proprietors upon the considerable increase in business which has taken place; the sale of gas being 13 p.ct. in excess of the previous year. The prolonged and disastrous coal strike necessitated the purchase of foreign coal at very high rates, and involved a consequent heavy increase in the cost of gas. In relation to this, an application was made to the Board of Trade, and an Amending Order obtained increasing the standard price until Dec. 31, 1927, from 16·8d. to 19·2d. per therm. With the return of normal conditions, a series of reductions was commenced which will shortly bring the price back to its former level. A sum of £20,000 of 6½ p.ct. preference stock, redeemable at par in 1937, was offered to the public in March and over-subscribed, a small premium being obtained; while £23,900 of 5½ p.ct. debenture stock, redeemable at the option of the Company between 1945 and 1955, has been placed at par. The new showrooms and stores at Cobham are proving very useful to the distribution department in that area, and add greatly to the character of the business premises of the town. A water gas plant has been installed at the Company's works, and is now in use. A new 12-in. main is being laid from the gas-works to Fetcham, in order to augment the supply in that neighbourhood. The three months' dividend due on the redeemable preference stock is to be paid at the maximum rate of 6½ p.ct., together with a dividend of 6 p.ct. on the ordinary shares for the whole of the year.

European Gas Company's Dividend.—The Directors of the European Gas Company, Ltd., have decided to pay, on Oct. 1, an interim dividend of 4s. per share, free of income-tax.

Reduction in Price at Waterford.—Intimating to the Waterford Chamber of Commerce a reduction in gas prices to 25·4d. per therm for lighting, and 18·4d. for power, and an increase in calorific value, the Manager of the Waterford Gas-Works (Mr. E. J. Edmonds) stated that one of the principal causes of the high price of gas was high wages.

Gas Classes at Liverpool.—The Principal (Mr. J. Scholes Hague, M.Sc.) of the Central Municipal Technical School, Byrom Street, Liverpool, forwards a copy of the prospectus of evening classes in gas engineering, gas-works practice, and gasfitting during the session 1927-28. Intending students should note that enrolment evening is Thursday, Sept. 15; while registered lessons commence on Monday, Sept. 19.

Coatbridge Gas Company.—Submitting the accounts for the year ended June 30, the Directors state that the sale of gas for the twelve months amounted to 1,315,270 therms, which was an increase of 2816 therms over the previous year. Owing to the increased cost of raw material during the coal stoppage, it was necesary to raise the gas charge to 9·6d. per therm for nine months from Oct. 1 last. Dividends at the authorized rates are recommended.

Imperial Continental Gas Association Dividend.—The Directors of the Imperial Continental Gas Association intend shortly to declare, out of the ascertained profits of the half-year ended June 30, 1927, an interim dividend at the rate of 5 p.ct. (actual) on the £1,976,000 capital stock of the Association, payable, less income-tax at 4s. in the pound, on Nov. 15. The transfer books of the Association will be closed from Oct. 19 to Nov. 1, both days inclusive.

Dividends and Price at Hastings.—The Hastings and St. Leonards Gas Company are paying interim dividends at the following rates per annum (less income-tax): £6 15s. p.ct. on the 5 p.ct. converted stock, £5 5s. p.ct. on the 3½ p.ct. converted stock, and £6 4s. 6d. p.ct. on the 5 p.ct. additional stock. The current price of gas is 11½d. per therm, which was the figure before the coal strike; but as from the September reading of the meters, the price is to be reduced to 11d. per therm, or 4s. 2·6d. per 1000 c.ft.

Carbonizing Plant at Coleraine.—The Gas Committee have reported to the Coleraine Urban District Council that the Acting Manager had called attention to the unsatisfactory condition of the retort bench and to the inadequacy of the present carbonizing plant, stating that it was too small to meet with safety the increased demand for gas in the town. The present plant was erected in 1906, when the output was 21 million c.ft. per annum; whereas now it exceeded 40 million c.ft. It was decided to instruct the Acting Manager to obtain schemes and estimates to enable the Committee to deal with the matter.

Electric current for lighting and other purposes suddenly failed at the Bradford Royal Infirmary on the night of Aug. 30, and the major part of the extensive buildings—including several wards and the massage department—was left in darkness.

The Manchester and District Regional Smoke Committee are considering the framing of by-laws empowering local authorities to make heating by electricity, gas, or smokeless fuel obligatory in new buildings within a radius of 15 miles of the city.

The Chairman of the Blackburn Corporation Gas Committee has reported that after paying all expenses in connection with the gas exhibition held in March last, there was a profit on the event of £143. Of this amount, £100 was subscribed to the War Memorial Fund.

When the House Committee recommended to the Lichfield Board of Guardians the acceptance of a tender for an electric lighting installation at the Infirmary, Mr. F. Hill proposed that a gas expert should examine the present fittings, and report to the next meeting before any further action was taken. He said there was only gas at the Rugeley hospital; and he had not heard a single complaint. On being put to the meeting, Mr. Hill's proposal was adopted by 13 votes to 12.

STOCK MARKET REPORT.

THE Stock Exchange last week presented quite a cheerful appearance. While business in gilt-edged securities was restricted owing to the uncertain monetary outlook, in the Industrial Market there was again considerable activity. Prices rose rapidly, especially in Artificial Silks and Tobaccos. On the usual profit-taking by speculators at the end of the week, the market became quieter; but the prospects are still good, and, with the opening of the new twenty-one day account this week, further improvements are expected. With the revival of public interest there is likely to be many offers of capital by commercial undertakings, and reasonably attractive offers are assured of success. Such issues, however, are bound to reduce the number of transactions in existing shares. It is interesting to note that the new capital subscribed in the past eight months has exceeded all issues in a similar period since the boom year of 1920.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Sept. 2.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Feb. 10	5	5	Aldershot 5 p.c. max. C.	70—73	..	..
298,992	,,		4	4	Do. 4 p.c. Pref.	68—71	..	71
1,441,868	,,	Apl. 7	6½	7	Alliance & Dublin Ord.	84—87	..	85½
574,000	,,	July 14	4	4	Do. 4 p.c. Deb.	64—67	..	..
523,554	,,	Aug. 25	—	7	Barnet Ord. 7 p.c.	101—104*	..	..
300,000	1	Apl. 28	1/7½	1/7½	Bombay, Ltd.	1—1½	..	22/6
170,000	10	Aug. 25	8½	8½	Bournemouth 5 p.c.	12½—13*	..	12⅞—13
300,000	10	,,	7	7	Do. B 7 p.c.	13—13½*	..	12½—12⅝
375,000	10	,,	6	6	Do. Pref. 6 p.c.	10⅞—11½*	..	10⅞—11
80,000	Stk.	June 29	3	3	Do. 3 p.c. Deb.	54—57	..	..
165,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
357,900	,,	Aug. 25	—	7½	Brighton & Hove 6 p.c. Con.	102—105*	..	..
341,800	,,	,,	—	6/8/6½	Do. 5 p.c. Con.	92—95*	..	..
1,187,800	,,	July 28	5	5	Bristol 5 p.c. max.	84—85a	..	..
885,000	,,	Mar. 24	6	7	British Ord.	108—111	..	109½—110
100,000	,,	June 29	7	7	Do. 7 p.c. Pref.	113—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	78—78	..	..
200,000	,,	,,	—	33/3	Do. 5 p.c. Red. Deb.	94—96	..	..
100,000	10	May 26	6	8	Cape Town, Ltd.	7½—8½	..	..
100,000	10	Apl. 28	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	June 29	4½	4½	Do. 4½ p.c. Deb.	70—75	..	101½
486,960	,,	July 28	6	6	Cardiff Con. Ord.	97—100	..	..
327,660	,,	June 29	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
157,180	,,	Aug. 11	6½	5	Chester 5 p.c. Ord.	27—29½	+1	30/-
79,185	1	Apl. 28	†2/-	†2/-	Colombo Ltd. Ord.	29/—31/-	..	..
24,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	20/—22/-	..	..
251,490	1	Apl. 7	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	25/—27/-	..	..
178,900	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-	..	87—88
2,073,280	Stk.	July 14	—	5	Commercial Ord.	86½—88½	..	..
475,000	,,	June 16	3	3	Do 3 p.c. Deb.	56—59	..	..
800,000	,,	Sept. 30	‡2	‡1	Continental Union, Ltd.	34—37	..	34
900,000	,,	Mar. 10	7	7	Do. 7 p.c. Pref.	84—86	..	..
787,580	,,	Aug. 11	6½	6½	Croydon sliding scale	96—99	..	97½
408,100	,,	,,	5	5	Do. max. div.	77—80	..	78
482,270	,,	Aug. 25	9	8	Derby Con.	103—105a*	—1	..
55,000	,,	June 29	4	4	Do. Deb.	73—75a	..	..
209,000	,,	Aug. 25	5	5	East Hull Ord. 5 p.c.	76—79*	..	..
80,000	,,	June 16	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,068,180	10	Mar. 24	‡8	‡8	European, Ltd.	6½—6¾	..	6⅝—6⅞
18,747,460	Stk.	July 28	5	5	Gas Light & Coke 4 p.c. Ord.	84—88	+½	86½—87½
2,860,000	,,	,,	8½	8½	Do. 8½ p.c. max.	59—61	..	59⅝—60½
4,137,080	,,	,,	4	4	Do. 4 p.c. Con. Pref.	74½—76½	..	76½—76
5,000,000	,,	June 16	3	3	Do. 3 p.c. Con. Deb.	55—60	..	59½
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—103	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98—100	..	99⅜—99½
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
98,800	,,	Aug. 25	6½	6½	Hastings & St L. 5 p.c. Conv	88—91*	..	..
288,740	,,	,,	5½	5½	Do. 5½ p.c. Conv.	66—69*	..	68¾
70,000	10	Apl. 28	†10	†10	Hongkong & China, Ltd.	12—13	..	..
172,200	Stk.	Aug. 25	5	5	Hornsey Con. 5½ p.c.	65—68*	..	..
1,976,000	,,	May 12	10	10	Imperial Continental Cap.	139—141	..	139—141
268,180	,,	Aug. 11	8½	8½	Do. 8½ p.c. Red. Deb.	68—70	..	..
235,242	,,	Aug. 11	6½	7	Lea Bridge 5 p.c. Ord.	94—97	..	..
2,148,907	,,	Aug. 11	6½	5½	Liverpool 5 p.c. Ord.	84—85	..	..
600,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	103—105b	..	..
185,786	,,	Aug. 25	8	9	Maidstone 5 p.c. Cap.	107—112*	..	..
48,480	,,	June 16	3	3	Do. 3 p.c. Deb.	50—55	..	..
75,000	5	June 16	‡7	‡8	Malta & Mediterranean	5—5½	..	..
841,920	Stk.	May 26	‡5	‡7	Montevideo, Ltd.	90—92	..	91½
2,081,815	,,	July 28	5	5	Newcastle & Gateshead Con.	74—75d	..	..
880,922	,,	,,	4	4	Do. 4 p.c. Pref.	67½—68½d	+1	..
691,705	,,	June 29	3½	3½	Do. 3½ p.c. Deb.	65½—67½d	..	..
181,785	,,	Aug. 25	—	6/18/0	North Middlesex 6 p.c. Con.	90—95*	..	..
800,000	,,	Apl. 28	9	7	Oriental, Ltd.	100—102	..	..
188,120	,,	June 29	7½	7½	Plym'th & Ston'house 5 p.c.	102—107	..	..
414,800	,,	Aug. 25	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	102—105*	..	..
236,782	,,	,,	5	5	Do. 5 p.c. max.	76—79*	..	..
2,389,909	1	—	—	—	Primitiva Ord.	16/6—17/6	..	16/6—17/1½
282,200	100	June 1	4	4	Do. 4 p.c. Red. Deb.	84—86	..	..
600,000	Stk.	July 28	4	4	Do. 4 p.c. Red. Deb. 1911	71—73	..	..
484,963	,,	June 29	—	4	Do. 4 p.c. Cons. Deb.	71—73	..	..
180,000	10	Mar. 24	6	6	San Paulo 6 p.c. Pref.	7½—7¾	..	..
135,000	50	June 29	5	5	Do. 5 p.c. Red. Deb.	46—49	..	..
270,000	Stk.	Mar. 24	5⅜	5⅜	Sheffield A	102—104c	..	..
419,968	,,	,,	5⅜	5⅜	Do. B	102—104c	..	..
1,047,000	,,	,,	5⅜	5⅜	Do. C	102—104c	..	..
90,000	10	May 26	4	6	South African	4—6	..	..
6,808,895	Stk.	Aug. 11	7	5	South Met. Ord.	101½—103½	+½	101½—102⅝
500,000	,,	—	—	—	Do. 6 p.c. Irred. Pf.	109—112	..	110½
1,595,445	,,	July 14	3	3	Do. 3 p.c. Deb.	56—59	..	..
784,000	,,	Mar. 10	6½	6½	Do. 6½ p.c. Red. Db.	102—104	..	..
91,500	,,	Aug. 11	8½	8½	South Shields Con.	101—103d	..	..
1,843,795	,,	July 28	6½	6½	South Suburban Ord. 5 p.c.	102—105	..	104
368,887	,,	June 16	5	5	Do. 5 p.c. Deb.	92—95	..	..
647,740	,,	Mar. 24	5	5	South'mpton Ord. 5 p.c. max.	74—77	..	76½—77
121,275	,,	June 29	4	4	Do. 4 p.c. Deb.	71—74	..	71
350,000	,,	Aug. 25	7	7	Swansea 7 p.c. Red. Pref.	100—102*	..	..
300,000	,,	June 16	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	..
180,000	,,	July 28	7½	7½	Tottenham District A 5 p.c.	105—108	..	..
862,275	,,	,,	6½	6½	Do. B 3½ p.c.	89—92	..	..
180,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	95—98	..	..
151,355	,,	June 16	4	4	Do. 4 p.c. Deb.	70—73	..	..
288,351	,,	Mar. 10	5	5	Tynemouth Con. and New	73½—74½d	..	..
299,094	,,	Aug. 25	6½	6½	Uxbridge, Maidenhead, & Wycombe 5 p.c.	85—90*	..	..
98,880	,,	,,	5	5	Do. 5 p.c. pref.	83—88*	..	..
30,000	,,	July 14	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	117—122	..	..
365,000	,,	,,	7	7	Do. B 3½ p.c.	100—105	..	102½—103
433,685	,,	,,	5/19/0	5/19/0	Do. C and New	88—93	..	..
888,000	,,	,,	6⅝	6⅝	Do. Wimbledon 5 p.c.	98—103	..	..
99,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	100—105	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	83—88	..	86½
88,416	,,	June 29	3	3	Do. 3 p.c. Deb.	52—55	..	..
284,742	,,	,,	4	4	Do. 4 p.c. Deb.	73—76	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle e.—Sheffield. * Ex. div. † Paid free of income-tax. ‡ For year.

There is little to record in the Gas Market. As will be seen from the Table, only four quotations (other than *ex* div.) were changed, and these were in an upward direction. The Gas Light ordinary rose ½, to 86-88; the South Metropolitan ordinary ½, to 101½-103½; Chester ordinary 1, to 87-92; and Newcastle 4 p.c. preference 1, to 67½-68½. With regard to the South Metropolitan stock, this is the highest price at which the stock has stood since the introduction in 1920 of the basic price and dividend system, with its distribution of "surplus profits," and would appear to indicate a belief that the prospects of a higher dividend for the current year than 6 p.c. (the highest hitherto paid) is possible.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 85½, Cardiff 101¼, Commercial 87¾, European 6 5/16, 6⅜, 6 7/16, Gas Light and Coke 86⅛, 87½, 4 p.c. preference 75½, 76, 3 p.c. debenture 59½, 5 p.c. debenture 99⅜, 99¾, Hastings and St. Leonards 3½ p.c. debenture 68½, Primitiva 16s. 6d., 16s. 7½d., 16s. 9d., 17s., Wandsworth "B" 103. Supplementary prices, Ascot 4½ p.c. debenture 71½, California 5 p.c. Bonds 105½, Hastings 3½ p.c. debenture 60.

On Tuesday, Aldershot 4 p.c. preference 71, British 109½, Commercial 87, European 6 5/16, 6⅜, 6 7/16, Gas Light and Coke 86⅜, 86⅞, 87¼, 4 p.c. preference 75½, 5 p.c. debenture 99⅜, Imperial Continental 141, Liverpool 7 p.c. preference 103½, Primitiva 16s. 7½d., 16s. 9d., 16s. 10½d., 17s., 17s. 1½d., South Metropolitan 101⅜, 102, 102 1/16, South Suburban 5 p.c. 104. Supplementary prices, Eastbourne 3½ p.c. "B" 103½.

On Wednesday, Bournemouth 5 p.c. 12⅝, 13, "B" 12½, 12⅝, 6 p.c. preference 10⅞, 11, British 110, Colombo 30s., Commercial 87, 87½, Croydon sliding-scale 97½, maximum dividend 78, European 6 3/32, Gas Light and Coke 86⅞, 87, 87¼, 5 p.c. debenture 99⅜, Imperial Continental 141, Primitiva 16s. 9d., 16s. 10½d., 17s., South Metropolitan 102. Supplementary prices, Liverpool 5 p.c. 85⅝.

On Thursday, Commercial 87, 87½, 88, Continental Union 34, European 6⅜, Gas Light and Coke 86⅛, 87½, 3½ p.c. 59⅜, 60⅛, 4 p.c. preference 75⅞, 5 p.c. debenture 99¾, Imperial Continental 139, 140, Liverpool 7 p.c. preference 103½, Montevideo 91½, Primitiva 16s. 9d., Wandsworth 5 p.c. preference 86½. Supplementary prices, Hampton Court 4 p.c. debenture 75, Montevideo 5 p.c. debenture 88½, Torquay and Paignton 5 p.c. preference 87, 87½.

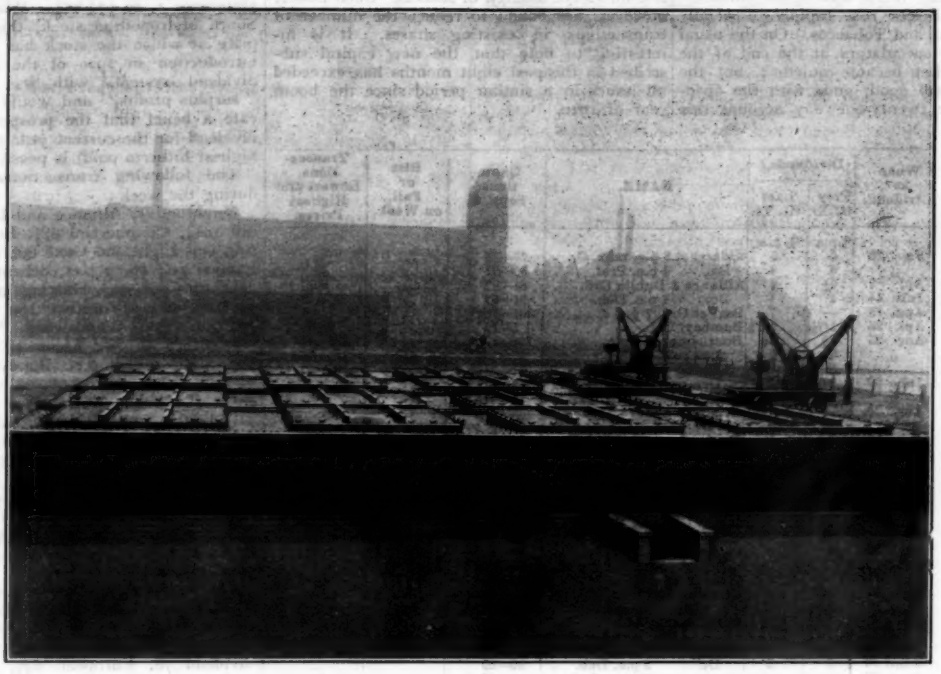
On Friday, Bombay 22s. 6d., Bournemouth 7 p.c. maximum 12½, 6 p.c. preference 10 5/16, European 6⅜, Gas Light and Coke 86½, 86⅞, 87, 87¼, 87½, 3½ p.c. maximum 60⅛, 60¼, 5 p.c. debenture 99⅜, 99½, Newcastle 3½ p.c. 74¾, South Metropolitan 102, 102⅛, 6 p.c. preference 110½, Southampton 5 p.c. 76½, 77, 4 p.c. debenture 71, Wandsworth "B" 102½. Supplementary prices, Holyhead and North Wales 7s.

In Lombard Street the anticipated shortage of money at the end of last month did not materialize, and no application had to be made to the Bank of England. The distribution of Government dividends partly relieved the situation, and week-end credits were plentiful. Borrowers at the opening paid 3½ p.c. for new money, but the rate eased off gradually to 3 p.c. Sales of October bills lessened expectations for the current week. There was little variation in the Treasury Bill rate; the average being about 1 3/16d. p.c. above the previous week's rate at £4 6s. 2·7d. p.c.

On the Foreign Exchange Market, rates were fairly steady. The dollar-sterling closed unaltered at 4.86 1/32. The Milan rate rose 10c. to 89.65. The Dutch rate again moved against sterling, finishing at 12.13; and there was a reaction in pesetas, which closed higher at 28.75. Belgas and francs remained unchanged.

Silver was advanced 1/16d. to 25 5/16d. per oz. on support from both India and China; and the price of Gold remained at 84s. 10½d. per oz.

The Bank Rate is 4½ p.c., to which it was reduced from 5 p.c. on April 21. The bank's deposit rate is 2½ p.c., and the deposit rates of the discount houses are 2½ p.c. at call and 2¾ p.c. at notice.



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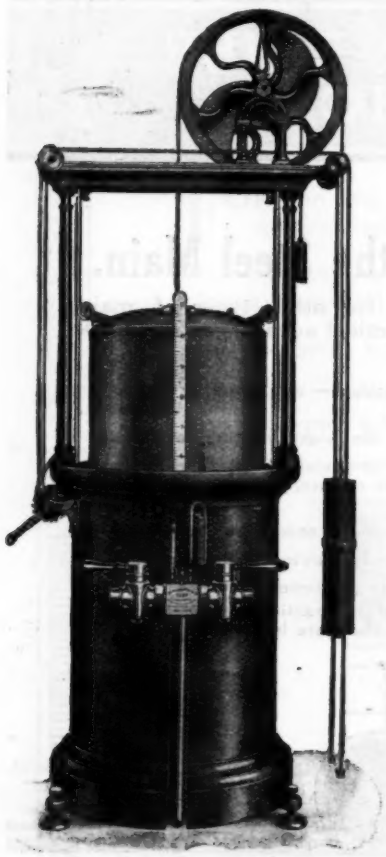

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